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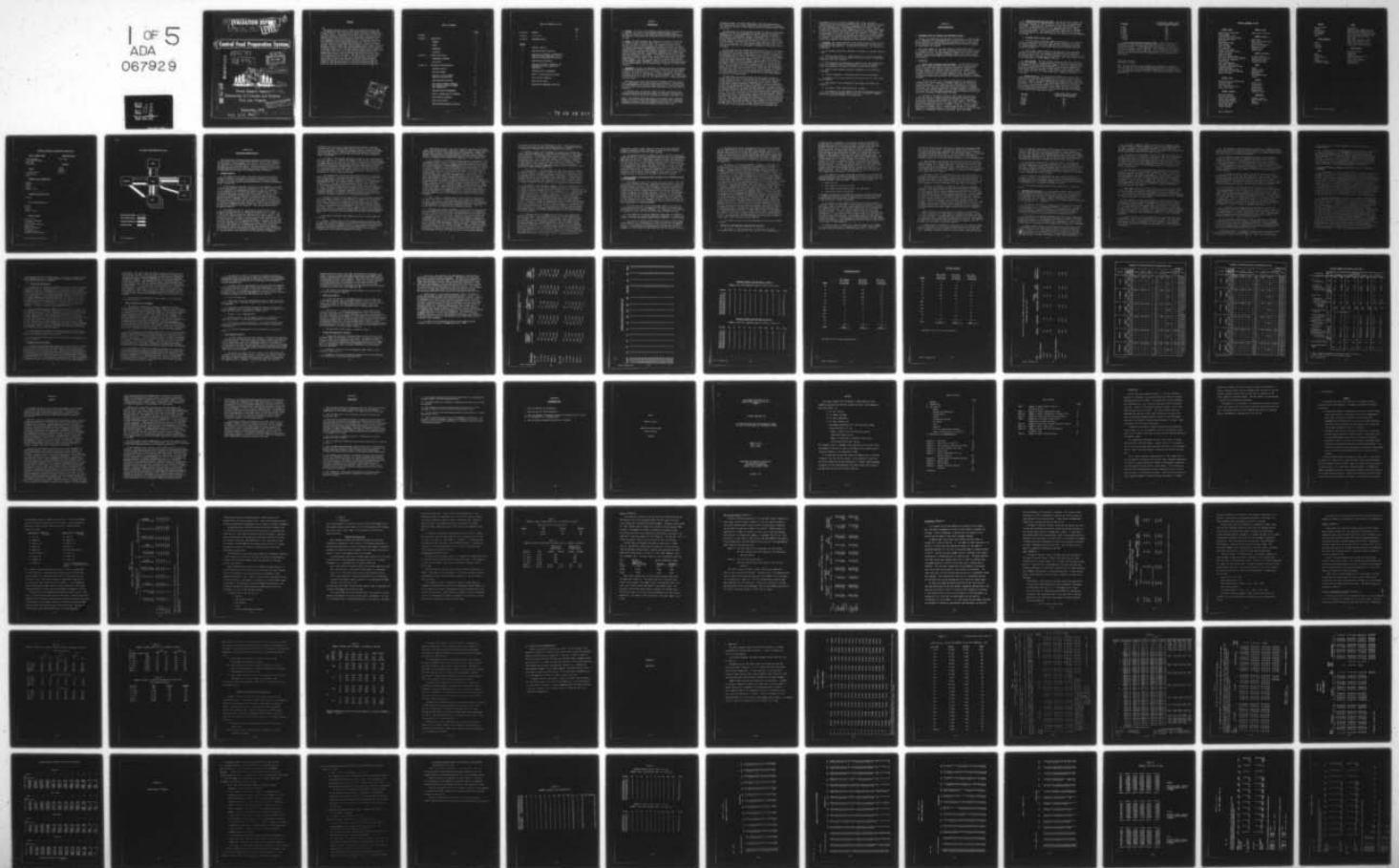
TROOP SUPPORT AGENCY (ARMY) FORT LEE VA
CENTRAL FOOD PREPARATION SYSTEM. (U)
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EVALUATION REPORT.

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Central Food Preparation System.

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Troop Support Agency (Army)
Directorate of Concepts and Systems
Fort Lee, Virginia

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ABSTRACT

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The design objectives of the central food preparation concept were to provide improved meal service to the soldier and reduce expenditure of Army resources. After initiating a request for Military Construction, Army (MCA) funds, the Department of the Army, Deputy Chief of Staff for Logistics (DA DCSLOG) decided to defer construction of permanent Central Food Preparation Facilities pending the results and experience gained from operating the Fort Lee interim facility. During 1978, the Central Food Preparation System (CFPS) became operational. The CFPS evaluation provided those actual experience data necessary to conduct the economic analyses, verify staffing levels, assess consumer food acceptance, determine personnel attitudes, define the field feeding interface, observe numerous operational aspects of the CFPS, and address the mobilization capabilities of the CFPS. Assessment of the data collected, when projected against the expected potential for food service operations at Fort Lee and other installations, reveals that the CFPS does not completely satisfy either of the design objectives evaluated. The CFPS is not a cost effective food service system for the Army, and a uniformly high quality meal service was not consistently obtained during the evaluation. Even though food quality can be improved, the system will not become cost effective. The implementation of a Central Food Preparation System within the Army should, therefore, not be given further consideration.

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I	MOBILIZATION IMPACT
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SECTION I

INTRODUCTION

A. PURPOSE: The Central Food Preparation System (CFPS)* was evaluated at Fort Lee, VA, during the period March through September 1978 to determine the viability of this system to provide a uniform high quality meal service to the soldier and to determine overall associated cost to the Army.

B. SCOPE: The CFPS evaluation was conducted in accordance with US Army Troop Support Agency Evaluation Plan, Central Food Preparation System, Fort Lee, VA, dated 27 February 1978. The evaluation encompassed an economic analysis, staffing requirements, consumer acceptance, conformance to acceptable technological engineering and operational practices, quality assurance/quality control, mobilization or expansion capabilities, interface capabilities with peacetime field feeding requirements, and command and food service personnel attitudes. Organization responsibilities for the CFPS evaluation program were as follows: the DA DCSLOG, overall project management; the Troop Support Agency (TSA), concept developer/refiner and overall responsibility for the conduct of the evaluation; Training and Doctrine Command (TRADOC) - Fort Lee, operator and user evaluator; Natick Research and Development Command (NARADCOM), technical advisor and engineering support from the RDT&E program; and the Surgeon General, adherence to public health standards.

C. BACKGROUND: In 1969, the Department of Defense Facilities and Equipment Planning Board accomplished an on-site survey of military garrison feeding facilities in the United States. As a result of this survey, this board authorized, with DOD and Army approval, a Natick Laboratories research and development project, to study, define, and then implement a new, modern food service system at Fort Lewis, WA. The objectives were to improve performance and reduce costs.

The overall study effort was initiated in November 1970 under Project Number 1J662713AJ45, Systems Studies and Military Feeding. The purpose of this study effort was to develop a modern food service concept which would increase customer satisfaction and reduce operating costs in that order of importance.

In November 1970, the Chief of Staff of the Army established the DA Subsistence Operations Review Board (SORB) to investigate the adequacy of the Army food service system and to develop an effective, efficient, and

*NOTE: The following activities constitute the Central Food Preparation System at Fort Lee: Central Food Preparation Facility (CFPF), Ingredient Preparation Area (IPA), Satellite Dining Facilities (SDF's), Troop Issue Subsistence Activity (TISA), and Technical Support Office (TSO).

economical system. The board learned that the many deficiencies found were caused by the use of small, inefficient, and independent food preparation facilities operated in many cases by unqualified personnel under minimal supervision.

The SORB study also noted the many advantages of commercial central food preparation systems and recommended that the Army develop the concept for implementation at installation level and that a prototype facility be established for developmental purposes. During August 1971 - June 1972, Natick Laboratories tested the concept at Fort Lewis, WA, to establish the means to improve food service and to validate the technical feasibility of the CFPF concept. Concurrent with the Fort Lewis study was a similar small scale test at Fort Lee, VA. These initial studies indicated that a CFPF would be cost-effective, reduce manpower requirements, and increase customer acceptance.

In 1973, Army officials advised the Investigative Staff for the Committee on Appropriations, US House of Representatives, on Department of the Army, FY 74 Military Construction Program, that in order to further evaluate the CFPF experiment at Fort Lewis, the Army was in the process of installing an interim CFPF system at Fort Lee, VA. This facility was approved by Congress as an Urgent Minor Construction Project in FY 73. The facility was to provide an on-going operational CFPF for the development of doctrine and procedures required to operate permanent CFPF's later, as well as to train CFPF cadres. The initial estimate of completion for the interim facility at Fort Lee was October 1973. Also initiated during this time frame was a request for FY 74 Military Construction, Army (MCA) funds for two permanent CFPF facilities, one at Fort Lee, VA, and one at Fort Benning, GA. The FY 75-79 Five Year Defense Plan included an additional 19 permanent CFPF's. The 1974 estimate for the total of 21 CFPF's (FY 74-79) was approximately one quarter of a billion dollars.

The Urgent Minor Construction Project was placed under contract in January 1974 for the Fort Lee interim CFPF and the upgrade and improvement of eight dining facilities. The scope of work for the central kitchen facility which was to be placed in a permanent dining facility called for the addition of limited supplemental floor supports. On-site investigations revealed that strengthening the floor as specified would not meet the load bearing requirements for the central kitchen equipment. Subsequent functional and economic evaluations indicated that relocating the kitchen to an alternate building (6220) would be less costly and time consuming than strengthening the floors. Work on all other aspects of the project was substantially complete and within the current working estimate (CWE) of \$253,000; however, the CWE for the overall project, including the relocation of the central kitchen, was \$780,000. This revised CWE exceeded the urgent minor construction statutory authority. The Army notified Congress that it intended to proceed with the construction of the interim facility as a major change in scope to the FY 74 permanent CFPF at Fort Lee, VA. Further, the Army notified Congress in May 1975 that it had reevaluated the CFPF concept and recommended that

programming action on the overall permanent CFPF concept, including construction of the previously authorized project at Fort Benning, be deferred pending availability of experience to be gained from the operation of the Fort Lee interim facility. The Congress and Office Secretary of Defense supported this "Fry Before We Buy" request by the Army. Construction planning to effect the necessary interim facility changes was begun immediately. The Central Kitchen Facility was accepted from the contractor on 29 August 1977. During November and December of that year, the facility was staffed, training was begun, and the equipment was operationally tested and adjusted/repaired as necessary. In January and February of 1978, the CFPF began to produce products for inventory, and in March the formal evaluation began.

D. OBJECTIVE: The primary objective of the evaluation program was to collect those baseline data required for use in determining whether the CFPS should be adopted for future Army use. To achieve this objective, the following was accomplished:

1. An economic analysis was conducted to determine the economic viability of CFPS.
2. Staffing requirements for a CFPS (Central Food Preparation Facility, Troop Issue Subsistence Activity, Satellite Dining Facilities, and Ingredient Preparation Area) were determined.
3. CFPS operations were analyzed for compliance with good manufacturing practices to determine efficient CFPF production criteria and equipment, design, and operational deviations from these criteria were assessed.
4. Quality control/quality assurance requirements for the CFPS were established.
5. Consumer acceptance of centrally prepared foods was determined.
6. Command and food service personnel attitudes towards the CFPF concept were determined.
7. CFPS interface with installation field feeding requirements was determined.
8. The impact of CFPS on mobilization was assessed.
9. A determination was made whether a Central Food Management structure (Directorate of Food Management (DFM) at Fort Lee) is required to manage a central food preparation system on an installation.

SECTION II

SYSTEM DESCRIPTION

A. MANAGEMENT STRUCTURE (CENTRAL FOOD MANAGEMENT SYSTEM):

The Fort Lee installation food program is controlled by a central manager who is responsible for the management of the corporate Fort Lee TDA and TOE dining facilities to include food service personnel as well as the control of the logistical and training (garrison/field) efforts required to support the installation food program.

The central manager for the food program is called the Director of Food Management (DFM) and, like other installation directors, reports directly to the Chief of Staff. The DFM organization consists of a Director of Food Management (Central Food Manager), Technical Support Office (TSO), Support Division, Dining Facility Operations Division, and the Central Food Preparation Division.

B. FACILITIES:

1. Central Food Preparation Facility (CFPF): The CFPF (Bldg 6220) was established to centrally prepare food items which entail advanced cooking skills or for which high labor and intensive preparation techniques are normally required. Selected menu items are prepared for inventory in sufficient quantities to afford economic production and inventory levels in support of projected headcount and preference ratios. The centrally prepared food is held under controlled temperatures and subsequently issued to satellite dining facilities (SDF's) for finishing and serving to authorized personnel.

a. The Fort Lee CFPF is an interim facility and was not designed in accordance with concept designs for permanent CFPF's as developed by the Troop Support Agency. It is composed of the following areas: ingredient staging; dessert production; entree production; portioning and packaging; and storage. The ingredient preparation area would normally be contained within the CFPF building; however, due to funding constraints associated with the interim CFPF, the ingredient preparation area is separated from the main facility by a distance of approximately 200 yards.

b. The CFPF was designed to produce at least 9,000 meals per day. Certain menu items are completely processed and packaged within the CFPF so the only subsequent actions required at the SDF's are heating (when appropriate), garnishing and serving (i.e., baked lasagna). Other items are partially processed so that a few simple additional steps at the SDF's produce a finished menu item (i.e., salads). A list of centrally prepared menu items is attached at Tab A. Certain items continue to be delivered directly to the dining facilities to be prepared as they are under the current system (i.e., hamburgers, brown and serve rolls, eggs, and steaks).

2. Ingredient Preparation Area (IPA): The IPA is located in Bldg 7118 and is concerned with the tempering and cutting of meats, the weighing and measuring of ingredients, and the washing, cutting, and packaging of vegetable items. Items handled in this area are either prepared for direct delivery to the dining facilities (i.e., tempered meats, sliced luncheon meats, or salad items) or sent to the ingredient staging area of the CFPF for further processing. Raw ingredients for some items, such as salisbury steak and meatballs, are mixed and formed in the IPA before they are forwarded to the CFPF.

3. Technical Support Office (TSO):

a. The TSO assists the Director, DFM, in the discharge of his responsibility to provide troops with food items that meet wholesome, nutritional, and quality standards. This office also assists in maintaining acceptable safe working environments in and around the facilities operated under the control of the DFM.

b. The TSO Chief reports directly to the Director of Food Management. Reporting to the TSO Chief is a Quality Control/Microbiology Team and an Internal Sanitation Team. The personnel required to staff the Quality Control/Microbiology Team are assigned to the Food Service Test Support Element of the Medical Department Activities (MEDDAC), Fort Lee.

4. Pilot Kitchen The Pilot Kitchen, located in Bldg 7118, is used to provide the following: refinement/development of production operating guides and formulations without disrupting the regular or full scale production runs in the CFPF; limited CFPF backup capability in the event of equipment malfunction; and preparation of entree items subject to deterioration during summer months when the temperature in the central kitchen becomes a critical factor (unlike the CFPF, the Pilot Kitchen has a temperature controlled environment).

5. Dining Facilities: The Dining Facility Operations Division, DFM, is responsible for the control and operation of all Fort Lee dining facilities (DF's) which include establishing operating hours, administration, technical assistance, training, personnel staffing and selecting which facilities remain operational. This is opposed to most conventional methods whereby dining facilities are controlled and operated by a company, battalion, or brigade. When receiving central support from the CFPF, these DF's are classified as satellite dining facilities (SDF's). The following DF's/SDF's are available to the Dining Facility Operations Division:

BUILDING

US ARMY TROOP SUPPORT AGENCY
(USATSA) DESIGN CAPACITY

P-9300*	300
P-9303*	300
P-9304*	300
P-8402	771
P-8400	771

BUILDINGUS ARMY TROOP SUPPORT AGENCY
(USATSA) DESIGN CAPACITY

P-3701	491
P-3206	386
P-3024*	300
P-3108	425
P-3118*	300
T-2012**	120
T-2011**	120
T-2000**	120

6. Troop Issue Subsistence Activity (TISA): Support Division, DFM, is responsible for the operation of the TISA which performs troop issue subsistence accounting and requisitioning, and conducts receipt, storage, and issue functions. The TISA supplies raw food materials to the IPA for scaling and subsequent issue to the CFPF. After preparation, the finished products are received from the CFPF into the TISA's inventory for subsequent issue to the SDF (the chart at Tab B diagrams the flow of documents and subsistence).

*Modernized Facility

**World War II Vintage

NOTE: The approved TDA for this evaluation was based on the operation of eight satellite dining facilities supporting approximately 6,000 meals per day. This TDA also authorized additional staffing in the event meal requirements progressively increase to a level of 6900, 7800, 8700, 9600, or 15,000 meals per day.

PRODUCTS PREPARED IN CFPF

ENTREE - Beef

Apple Glazed Corned Beef
Baked Lasagna
Barbecued Beef on Bun
Barbecue Sauce for Spareribs
Barbecued Beef Cubes
Beef Stew
Braised Beef Cubes
Chili w/Beans
Chili w/o Beans
Chili Macaroni
Creamed Ground Beef
Chicken Fried Beef Patties
Franks and Beans
Ginger Pot Roast
Meat Loaf w/Brown Gravy
Meatballs and Sauce for Spaghetti
Meat Sauce for Spaghetti
Pepper Steak
Pork Chops Mexicana
Roast Beef w/Brown Gravy
Salisbury Steak w/Brown Gravy
Swedish Meatballs
Swiss Steak w/Brown Gravy
Tomato Sauce for Veal Parmesan
Yankee Pot Roast

ENTREE - Pork

Baked Pork Slices w/Brown Gravy
Braised Spareribs
Pork Chop Suey
Roast Pork w/Brown Gravy
Sweet & Sour Pork

ENTREE - Poultry

Barbecued Chicken
Chicken Cacciatore
Country Style Chicken
Savory Baked Chicken
Southern Fried Chicken
Oven Fried Chicken
Turkey Chow Mein
Turkey Scallops

ENTREE - Fish

Baked Tuna and Noodles

ENTREE - Other

Baked Beans
French Fried Cauliflower
Fried Cabbage
French Fried Eggplant
Macaroni & Cheese
Spanish Onions
Spanish Rice

ENTREE - Potatoes

Au Gratin Potatoes
Candied Sweet Potatoes
Fried Potato Cakes
Scalloped Potatoes

SOUPS

Creole
Cream of Potato
Knickerbocker
Minestrone
Old Fashioned Bean
Spanish

GRAVIES

Brown Gravy
Chicken Gravy
Cream Gravy
Mushroom Gravy
Turkey Gravy
Vegetable Gravy

SANDWICHES

Bologna & Cheese
Ham & Cheese on Rye
Salami
Submarine

COOKIES

Chocolate Chip
Oatmeal
Peanut Butter
Refrigerator
Shortbread
Sugar

CRISPS/CRUNCHES

Apple
Apricot
Cranberry
Pineapple

PIES

Apple
Blueberry
Coconut Cream
Peach
Pineapple Cream
Pie Shells (Single)

CAKES

Apple Sauce
Chocolate Cake w/Chocolate Icing
Chocolate Cake w/Vanilla Icing
Devils Food Cake w/Chocolate Icing
Devils Food Cake w/Vanilla Icing
Spice Cake w/Vanilla Icing
Short Cake
White Cake w/Chocolate Icing
White Cake w/Vanilla Icing
Yellow Cake w/Chocolate Icing
Yellow Cake w/Vanilla Icing

MISCELLANEOUS

Chocolate Brownies
Fruit Bars
Gingerbread
Powder and Yeast Biscuits
Quick Coffee Cake
Yeast Raised Doughnuts
Cake Doughnuts
Cinnamon Rolls

PRODUCTS PREPARED IN INGREDIENT PREPARATION

MEAT & CHEESE ITEMS

Sliced Bologna
Diced Cheddar Cheese
Diced Ham
Sliced Ham

MARINATED SALAD

Three Bean

POTATOES

Diced
Peeled
Shredded
Sliced

SAUCES

Seafood Cocktail
Chili Mustard
Tartar

SHREDDED SALAD INGREDIENTS

Carrots
Cabbage
Celery
Lettuce
Peppers, Green

CHOPPED SALAD INGREDIENTS

Cabbage

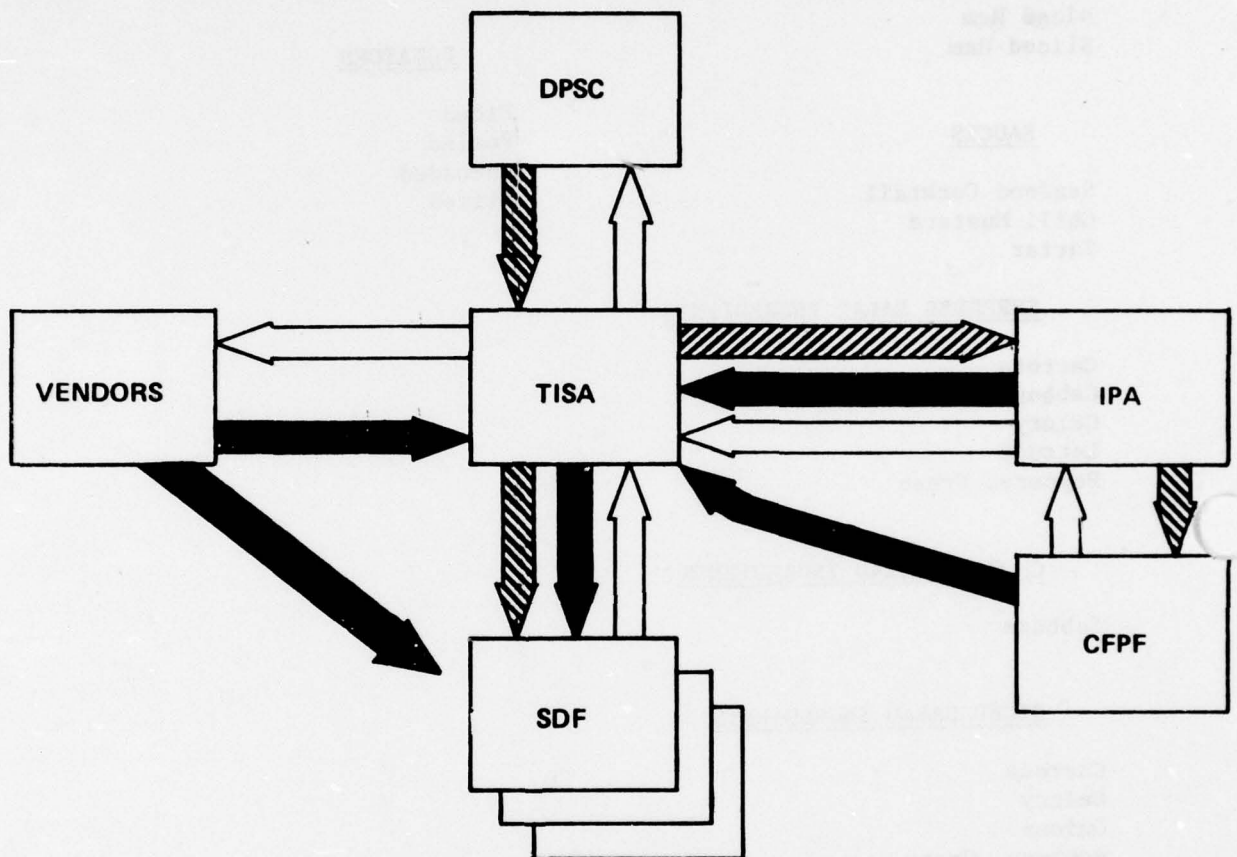
DICED SALAD INGREDIENTS

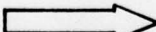


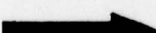
Carrots
Celery
Onions
Peppers, Green

GELATIN SALADS

Cherry Jello
Cranberry & Pineapple
Jellied Pear
Jellied Fruit Cocktail
Melba Mold
Orange & Pineapple
Peach Jello
Pineapple & Pear
Strawberry and Pineapple

DOCUMENT AND SUBSISTENCE FLOW



REQUEST FOR ISSUE 
 RAW INGREDIENTS 
 FINISHED PRODUCTS 
 VENDOR ITEMS 

SECTION III

EVALUATION FINDINGS/RESULTS

The Central Food Preparation System evaluation was conducted jointly by the Troop Support Agency, US Army Natick Research and Development Command, and Directorate of Food Management, Fort Lee, VA. Each of these activities was responsible for evaluating specific aspects of the system and for the preparation of an After-Action Report. The findings/results of the separate analyses conducted during the evaluation program are summarized below and the individual detailed reports are annexed as specified therein.

A. ECONOMIC ANALYSIS:

1. An economic analysis (EA) of the Central Food Preparation System (CFPS) was conducted to ascertain the financial viability of the CFPS for the Army. The EA was performed in accordance with the guidance provided by AR 11-38, Economic Analysis and Program Evaluation for Resource Management, dated 15 January 1976.

2. The TSA Commander determined in March 1977 that NARADCOM, as the CFPS technical representative, should be responsible for the proper conduct of the EA. In exercising their management and control of this, the single most critical element of the CFPS evaluation program, NARADCOM chose to obtain a professional and unbiased agency in the actual conduct of CFPS EA. The University of Massachusetts, Department of Industrial Engineering and Operations Research was contracted by the Operations Research and Systems Analysis Office of NARADCOM to collect all necessary data from the Fort Lee CFPF operation and from other Army installations as required for performance of the EA in accordance with Army regulations. Guidance and assistance were provided by both NARADCOM and TSA to assure that all pertinent information and data were available to the contractor. The resulting detailed EA is presented at Annex A.

3. The methodology used for conducting the EA entailed the use of parametric economic analyses of comparative incremental costs for CFPS's on an annual cost method as opposed to conventional food service systems. Due to the interim configuration of the CFPF and to the limited number of troops supported by the Fort Lee CFPS, the actual experience data obtained may not be fully descriptive of permanent CFPS operations. Since these data are used to project expected costs for representative CFPS's, reasonable and practical limits are determined for each distinct cost element. These limits represent the various cost boundaries or parameters used in the EA and are used to depict the total system cost for all possible cost combinations analyzed. This parametric analysis thus allowed for the portrayal of total system costs for the full range of selected system parameters and also provided a vehicle for determining the system sensitivity for the various cost parameters.

Incremental costs were used to avoid confusion and eliminate unnecessary repetition due to the numerous common functions shared in both the CFPS and conventional systems. The annual cost method is closely attuned to government decision making in that it depicts total annual operating and capital costs and portrays the changing value of money with time, but does not emphasize return on investment.

4. In order to fully examine potential economies of scale, four possible CFPF site locations were selected for analysis. Fort Lee, VA, Fort Carson, CO, Fort Lewis, WA, and Fort Knox, KY, were chosen as representative of both FORSCOM and TRADOC CONUS installations with the range in average meals served per day progressively increasing from approximately 6,200 to approximately 28,000. Two of the installations contained a division-size unit (Carson and Lewis) and one contained a brigade-size unit (Knox). The mix in both type and size of the dining facilities located at these installations was considered to be representative of other CONUS installations.

5. Two regional CFPF facilities or CFPS complexes were also considered. Region One consisted of nine Army installations with a composite consumption level of approximately 45,000 meals per day. Region Two consisted of seventeen DOD installations with a composite consumption level of approximately 60,000 meals per day. Both regional support facilities were assumed to be operated out of a permanently constructed CFPF located at Fort Lee, VA. All of the supported installations were located within a 200 mile radius of Fort Lee. The regional analysis was essentially an exploratory extrapolation of currently available data and must be viewed only as an initial or basic "rough cut" analysis. Considerable additional data must be developed and thoroughly analyzed under numerous alternative system parameters before this concept can be properly subjected to the decision making process.

6. In order to account for the combinational or roll-up feature characteristic of parametric analyses, it was necessary to subdivide the food service system into a specific set of categories or cost modules. Each of these modules was functionally interrelated but uniquely independent with respect to cost. With this method of modularization, each separate module was fully defined by a relatively small and manageable subset of operational parameters. Total system costs (or, in this case, the incremental system costs) were then derived for each set of parameters analyzed simply by inputting the appropriate module subset of parameters and then summing the resulting individual module costs.

7. The seven cost modules which comprise the EA cost analysis model are as follows:

a. Capital - limited only to those incremental capital investment costs that would be incurred in adapting to a CFPS (the CFPF building and associated equipment plus additional storage freezers for each satellite dining facility). Peculiar to the economic analyses of the two regional CFPS's are costs for additional troop issue support activity (TISA) finished product freezer storage space at the satellite installations or bases.

b. CFPF Related Staffing - the cost of additional personnel in the CFPF support areas of supervision, troop issue, technical support, support division, and training, as well as direct CFPF personnel requirements to operate the quality control program, the microbiological laboratory, and the central kitchen. Staffing levels and associated costs for CFPF related staffing as well as for dining facility staffing are summarized at Tab A, Section III.

c. DF's Staffing - four different staffing levels are considered: first, the number of people required to operate the dining facilities in a strictly conventional garrison feeding environment based on proposed staffing requirements jointly developed by TSA and NARADCOM (see Tab B, Section III); second, the number of personnel required when supported with CFPF products (see Tab C, Section III); third, the currently authorized number of personnel for each dining facility (see Tab D, Section III); and fourth, the actual number of people assigned to each dining facility (see Tab E, Section III). These data for Forts Carson, Knox, and Lewis are summarized at Tab F, Section III. NOTE: The difference between the proposed staffing for the conventional system when compared to actual assigned staffing levels (last column of Tab F, Section III) would seem to indicate extremely positive cost benefits by adopting either the CFPF or the proposed conventional staffing configurations; however, these can only be considered as "paper" saving projections. These assigned personnel, in fact, represent trained TOE cooks who must be retained to satisfy the Army's combat mission including peacetime field training food service requirements. This differential will not be constrained unless drastic major Army policy changes are effected. Therefore, these personnel costs are referred to as a "readiness cost" or a penalty inherent to the peacetime CONUS Army food service program and are beyond the scope of this evaluation.

d. Food - savings are depicted only for that fraction (or percent) of the total dollar value of TISA issues for which savings are attributed to the CFPF. Such savings are achieved through more efficient food processing techniques generally associated with centralized preparation and the purchase of raw ingredients in larger and more economical containers. Food cost savings of 10, 15, and 20 percent were selected for the EA.

e. Utilities, Maintenance, and Repair - each installation analyzed used their own respective historical data to develop separate cost distribution factors for the allocation of utility and maintenance and repair (M&R) costs to their respective functional areas. The fixed cost contract method used for maintenance support to the Fort Lee CFPF was considered to present an unreasonably high cost picture for projecting this element of expense for normal CFPS operations. Also, installation of metering devices essential to the CFPS energy consumption analysis element of the CFPS evaluation program was not completed until mid-November 1978 and meaningful estimates for CFPS energy requirements are not currently available. Therefore, the EA utilizes the respective installation's utility and M&R costs distribution formulas adjusted by an analytical interpretation of CFPF related energy costs for food processing, freezing, and frozen storage, plus extrapolated M&R parts

costs based on actual Fort Lee CFPF experience data. Should timely results from the energy analysis warrant additional analysis, a supplemental EA will be conducted for consideration prior to Command decision review.

f. Supplies - supply costs are based on experience data obtained for the Fort Lee CFPF complex only. These data are extrapolated for the separate CFPF's analyzed in accordance with their respective production requirements and the projected levels of CFPF product support provided to the satellite dining facilities. Since the Fort Lee operation, by necessity, relied upon the extensive use of costly disposable containers for packaging the CFPF finished products, these supply costs were considered to represent a "high" or upper limit for CFPS operations. Less costly alternative packaging methodologies were examined by NARADCOM to provide a more reasonable or "low" projection of expected CFPF supply costs.

g. Transportation - since the normal 2-2-3 day supply delivery schedule for dining facilities is retained for both the CFPS and conventional systems with no basic change in methods of delivery, incremental transportation costs are analyzed only for the two regional CFPS configurations. These costs are portrayed relative to both the number of meals and number of satellite bases supported and are dependent upon the level of CFPF support provided, choice of the least costly alternative for commercial rail or truck, and the selection of the most economical delivery routes for the transportation mode selected.

h. An important system parameter utilized in the EA is identified as the CFPS Service Level or CSL. The CSL is defined as being that fraction or percentage of the total dollar value of food issued to a set of dining facilities that can be attributed to CFPF products at conventional costs. The CSL's selected for analysis were 30 and 50 percent. A CSL of 30 percent was attained during the CFPS evaluation and is considered conservative. A CSL of 50 percent is considered an approximate achievable upper limit for the CFPS since most breakfast, short order, and convenience items are not currently prepared in the CFPF and approximately 15 percent of total issues are vendor supplied. A CSL of 60 percent is viewed as a maximum upper limit for CFPS type operations; however, a 60 percent CSL was not used in this analysis since the current Army food service system is not structured to easily accommodate full CFPS operational efficiency potentials. To attain this CSL extreme, a radical new menu service would have to be developed specifically for the CFPS with associated major dining facility and equipment changes required to effectively optimize food service resources.

i. A composite roll-up or summary for each of the seven separate cost modules is provided at Tab G and Tab H, Section III for the respective 30 and 50 percent CSL's. These tables are structured to feature both the high and low supply cost parameters since these parameters were found to exert the most obvious impact in the parametric analysis. The total number of cook personnel required for a CFPS are reduced in all but the Fort Lee analysis. Cost savings attributable to the reduced satellite dining facility staffing; however, are not sufficient to offset the higher skilled CFPF staffing costs except for marginal savings at Fort Knox and for the two regional complexes (see Tab A, Section III). The inability to generate more pronounced personnel cost reductions in the satellite dining facilities must be interpreted as the single most significant cost element of the EA. Although projected food

savings also represent a major impact on total system costs, CFPS food savings are generally offset by increases in other costs (principally supplies and utilities) as the CSL level increases.

j. The economic analysis, as evidenced at Tab G and Tab H, Section III, reveals the CFPS to be not cost effective within the entire set of parameters identified for each of the installations selected as being representative of CONUS Army installations. These tables indicate potential cost efficiencies only for one of the two regions analyzed and these savings appear only for the most optimistic operational situations (parameters). The most favorable cost conditions for Fort Carson, Fort Knox, Fort Lewis, and Fort Lee result in net annual loss projections of \$1,076,471, \$1,165,377, \$1,186,439, and \$1,357,487 respectively. It should be reemphasized at this point that the analysis of the two regions should be viewed only as an initial or "rough cut" analysis and that projected system savings or losses make no attempt to address the cost of readiness for the Army's food service program.

B. WORK MEASUREMENT EVALUATION OF FORT LEE CENTRAL FOOD PREPARATION SYSTEM (CFPS) OPERATIONS:

1. Work sampling surveys of the various operating elements of the CFPS (Central Food Preparation Facility, Ingredient Preparation Area, Satellite Dining Facilities, and Troop Issue Subsistence Activity) were conducted to measure personnel performance, derive estimates of manpower requirements, determine the variation in workload for different jobs, establish the work content of each job for defining skill levels and training requirements, and provide inputs to the economic analysis. Prior to the work measurement studies, DA PAM 570-551, Work/Time Measurement Studies, and actual daily headcount histories were used as guidance in developing the TDA staffing levels needed to operate the CFPS. These staffing levels were approved by DA, TSA, Training and Doctrine Command, and Fort Lee (TDA dated 12 Jan 77). The work sampling surveys were performed to further validate and assess the labor requirements in a CFPS environment.

2. Personnel were hired by the Troop Support Agency and trained in data collection procedures by personnel from the Operations Research and Systems Analysis Office (OR/SA), NARADCOM. The collection of work sampling data lasted for three months and was supervised by NARADCOM personnel.

3. Upon completion of the work sampling surveys, data was validated, reduced, tabulated, and analyzed by personnel at NARADCOM. In summary, the results of the work measurement evaluation were indicative of the following:

a. The satellite dining facilities (SDF's), operating at TDA staffing levels, appeared to be functioning in a relatively efficient and adequate mode with fewer personnel than would have been required under conventional systems. It also appeared that productivity of the SDF work force was comparable to that achieved in some commercial and institutional facilities.

b. The productivity levels of the work forces in the IPA and the TISA were the highest observed of all the CFPS areas evaluated. These results appeared to be the outcome of a more stable and manageable work force. In addition, CFPF production levels did not manifest a major impact on the TISA storage and issue operations, and the IPA had been operating for nearly three years prior to the evaluation which allowed sufficient time to eliminate the problems normally associated with a new operation. Staffing in these areas seemed adequate and efficient, but no central criteria could be ascertained for comparison.

c. The results of the work sampling for the CFPF are inconclusive for reasons of high variance in production levels combined with a significant underutilization of available production capacity, both in labor and equipment. Although analysis of the data revealed favorable productivity in the CFPF consistent with those observed in the SDF's, NARADCOM personnel responsible for the work sampling program did not accept these as "pure" data representative of "normal" CFPF operations based upon a previously observed production level of approximately 200,000 entree servings per month (February and March 1978). The opinion was therefore expressed by NARADCOM personnel that the current CFPF staffing could have supported at least twice the production level experienced during the work sampling period. It is believed that staffing reductions could be effected without significant impact on CFPF production capabilities. Approximately 60,000 entree servings were produced in just four days during an expanded production test conducted in October 1978. This strongly indicates that the observed average daily entree production level during the work sampling period (approximately 5600 servings) was less than half of that which could have been reasonably expected. Scientists and food technologists from the NARADCOM Food Engineering Laboratory also expressed the opinion that the CFPF was not operating under optimal conditions and that the potential personnel savings were not being realized. The foregoing, coupled with TSA day-to-day observations throughout the entire evaluation period, necessitated a thorough reevaluation of CFPF staffing levels. The composite observations, experience, and professional judgements of TSA and NARADCOM were fully exercised to arrive at an adjusted CFPF staffing level which was incorporated into the economic evaluation. Adjustments to the TDA are summarized in Tab I, Section III. The staffing shown under the "old" column was developed by TSA based on earlier projections of CFPF workload and considered optimal production of a wide range of products (about 50% CSL). The reduced ("new") column is based on Fort Lee productivity and experience and reflects the staffing considered necessary to provide a 30% CSL (Fort Lee actual). The original Fort Lee CFPF staffing would be adequate to approximately support 13-14,000 meals per day at 50% CSL.

4. The detailed results of the work measurement evaluation are attached at Annex B.

C. ANALYSIS OF CFPF TECHNICAL OPERATIONS AND PRACTICES:

1. The purpose of this evaluation was to identify the operating characteristics as they existed in the Fort Lee, VA, CFPS environment and

to ascertain their conformance to the original concept of operation for the CFPS and/or accepted good food technology and preparation practices. NARADCOM Food Engineering Laboratory personnel conducted this effort and provided technical inputs for adjusting CFPS operations during the evaluation period. The report was written in terms of soft data, i.e., expert opinion, visual observations, and subjective interpretations of production reports generated within the CFPF. FEL observations in dining facilities were primarily during the period April through early June. Comments on CFPF operations were based on observations through August. The findings and results were formulated based upon detailed MFR's and trip reports of FEL personnel and were compared to recognized good practices accepted as the norm for commercial central food operations and standard military food service systems. The general categories of CFPS operations addressed include: the operating characteristics of the CFPF; CFPF product quality, yields and mix; personnel staffing, training, and expertise; equipment both in the CFPF and SDF; and the internal operations of selected dining facilities. (Fort Lee commented primarily on these same areas but from a user/operator perspective. See pages 20-21.)

2. The comparison of general operating characteristics of the CFPF with recognized good food technology and preparation practices revealed that the CFPF was operating in what has been described as a "kitchen mode" versus the originally intended "production mode." Evidence of this included:

- a. Small lot sizes
- b. Wide variances in production yields
- c. Short time intervals between runs of the same product
- d. Lack of floor quality control (QC)

According to FEL personnel, the CFPF will continue to experience difficulty in attaining its primary objective of high food quality at low cost, while operating under the observed mode of operation with a continued lack of strong, professional, production management.

3. The original concept design of the CFPF was to produce large lot/economical runs for each menu item to satisfy demand requirements for a full menu cycle. Under the 42-day menu concept, many entree items are scheduled for consumption only once. This concept, coupled with the low headcount at Fort Lee, in effect, forced the CFPF to produce smaller lot sizes than originally intended. In other instances, however, some food items which appeared more than once during a menu cycle were observed to have short time intervals between production runs. As an example, Roast Beef was shown to exhibit an average of less than ten days between production runs when larger batches were practical. FEL concluded that these two aspects of the internal operations created a job-shop environment and provided further evidence of the "kitchen mode" of CFPF operations.

4. Quality control as defined for a commercial production environment was found by FEL personnel to be nonexistent in the CFPF; rather, quality assurance (QA) was determined as the operating practice. QA was well

performed by the microbiology section in the sanitation and product safety areas of the central kitchen. FEL found no evidence that the results of the formal taste panel were translated into effective QC action. This was illustrated by the variable quality of the final product which was continually experienced during the report period. It was concluded that the poor performance of the QC function is further evidence of the "kitchen mode" approach to production in the CFPF and will continue to affect product quality.

5. Wide variances were experienced from projected production quantity yields and were a major CFPF problem. FEL noted that yields of three items chosen at random, i.e., creamed ground beef, roast beef, and chili macaroni, varied as much as 37% from expected values. Although yields were reported as having improved during subsequent visits, the variance remained considerably higher than could be accepted. FEL pointed out that both QC and management were at fault for this condition.

6. FEL observed that the operating personnel in the CFPF appeared to have the requisite skills necessary to perform their functions; however, the management and supervisory personnel did not possess the production type experience required to insure a smooth running and successful operation. FEL suggested that production-oriented personnel were needed, and that training must be improved to insure success prior to proliferation of the CFPF.

7. Equipment utilization in the CFPF was far below the anticipated level; many tasks were performed by hand labor when automatic equipment was available. As an example, FEL discovered on one occasion that ten people were performing by hand the entree packaging operation when only three would have been needed using the automatic Racque packaging line. Another example was the use of ten persons for unloading the Baker-Perkins blast freezer when only five were needed if the freezer's automatic mode was in operation. Excessive clean-up requirements for the equipment was often used as the reason for preferring hand labor over some of the automated production equipment. Some of the equipment was not considered appropriate for the CFPF. As examples, the breeder was noted as being the wrong type and required excessive hand operations, and the roll-in convection ovens were considered inefficient because they did not supply a uniform flow of heat throughout the ovens.

A major bottleneck to all operations in the CFPF was identified by FEL as the Baker-Perkins blast freezer which was originally designed to reduce the internal temperature of 1,000 pounds of a typical entree item from 180°F to 0°F in 1-1/2 hours. Although these specifications have never been tested, it is generally believed that these criteria were not attained. FEL suggested that the actual performance of the blast freezer be checked in order to determine the true freezer through-put capacity.

8. Certain aspects of the SDF's as they impacted on the CFPS environment were also evaluated. One of the major problems experienced initially was a negative attitude towards CFPF products by the dining facility workers and cooks. Inadequate training of cooks in operating under a CFPF mode was also

noted. Considerable improvement in both dining facility personnel attitudes and use of CFPF products were noted by the midpoint of the evaluation. Complaints were also noted concerning insufficient equipment in the dining facility. FEL indicated a more detailed analysis was in order to determine a more efficient configuration for the SDF under the CFPS environment. Finally, FEL stated that staffing was too high in the SDF's and could be lowered by adjusting the 42-day menu to balance the dining facility workload.

9. A study was conducted, via a literature search, to determine the nutritional value of foods prepared and frozen in a central preparation facility. This effort revealed very little data on large quantity production. Some loss in vitamins and minerals had been noted in previous studies on a cook/freeze system, but the final analysis appears to support the conclusion that the CFPS customer will be no more nutritionally deprived than customers of other presently used feeding systems.

10. In conclusion, FEL stated that the entire evaluation process was conducted too early in the operation of the CFPS. They recommended that although an initially unfavorable evaluation appears eminent, the CFPF should be reorganized to run as originally designed and that an evaluation should be started again once a steady-state operation is attained.

11. The detailed findings/results of FEL evaluations are attached as Annex C.

D. USER/OPERATOR EVALUATION: Fort Lee provided the operational environment for the Central Food Preparation System (CFPS) evaluation. The Fort Lee DFM was required to continue to satisfy their primary troop feeding mission while confronted with the reality of implementing and experiencing on a day-to-day basis the capabilities, nuances, practicality, and viability of the CFPS design concept. Comments relative to the findings and/or observations of the user/operator are as follows:

1. The TDA was considered to be deficient in several areas and justification was given for the following TDA adjustments: addition of a second Food Technologist and a floor supervisor in the central kitchen; addition of a Warrant Officer or Industrial Specialist in the Ingredient Scaling and Preparation Branch; addition of a food inspector for the Troop Support Division; and a general staffing increase in the dining facilities.

2. Difficulty in filling the authorized Industrial Engineer (Production Manager) position with an individual who possessed food production experience caused major problems in the development and operation of the system. This position was not filled until 30 days prior to commencement of the evaluation and then only after waiving the crucial requirement for food service experience.

3. Reduced staffing created an unfavorable morale problem among dining facility personnel and generally served to negate the apparent benefits of the CFPS. Dining facility cook resources were at, or below, the absolute minimum levels necessary to adequately prepare the predominantly non-CFPF supported breakfast and short order meals. In most cases, the absence of one cook required that supervisors be diverted to assist in food production.

4. The primary complaint voiced by the food service sergeants towards the CFPS was that an inadequate number of personnel was provided to do the job right. In addition, the reconstitution guides originally provided required considerable experimentation, testing, and change before consistently uniform quality was evidenced in the dining facilities.

5. The concept that supervision of actual food production within the central kitchen would be provided by the Industrial Specialist and one senior noncommissioned officer was found to be unworkable. The administrative burden placed on these two individuals severely restricted their abilities to provide overall supervision of production on a continuous basis. In an operation as varied as the CFPS, highly qualified food production personnel must be available to assist in the efficient execution of production and quality control plans.

6. The CFPF operational guides provided by NARADCOM provided adequate guidelines for initial start-up; however, feedback of experience data from production personnel and sensory, cook, and consumer reports necessitated numerous changes in ingredients and procedures. In the absence of a second food technologist in the TDA to provide "hands-on" qualified professional floor direction in the CFPF, such changes were normally made by production personnel on a costly and time consuming trial and error basis. Although product development and technical food production disciplines were not part of the CFPF, the available personnel were able to improve food quality as production experience was gained.

7. High volume production in March and April and limited freezer storage space at the TISA, coupled with a reduction in the Fort Lee supported troop strength, dictated that production be curtailed to one or two entrees per day. This decrease in production requirements caused employee morale problems which were solved primarily at the expense of operating efficiency by scheduling more frequent and smaller production runs.

8. The requirement to adapt production to the 42-day menu cycle was considered to be the principal factor responsible for the failure to achieve an operational "production mode" in the CFPF. The multiplicity of items, many of a similar nature, which appeared only once or twice in a menu cycle were initially scheduled and produced. These small job lots severely taxed the CFPF support systems, particularly in the areas of preproduction preparation and freezer storage, and also frustrated the application of quality production techniques. Ultimately, the requirements to adhere to the master menu were reappraised.

9. Physical facilities were acceptable for the interim CFPF, but their configurations, construction, and location were not ideal. Individual large capacity food production equipment was not fully integrated into a system which allowed the user to capitalize on their capability. A high degree of manual effort was required to support all operations in at least one stage of production.

10. The Ingredient Scaling and Preparation Branch, as a separate entity, appears to be a cost efficient operation in support of dining facility requirements for salads, salad ingredients, processed meats (including shingled bacon), and natural cheese, and should be reevaluated.

11. The quality of some raw ingredients obtained from the Military Subsistence Supply System was not always satisfactory: diced beef was not uniform in size and contained large amounts of fat and gristle; cut-up chicken was inconsistent in size and processing frozen chicken resulted in an undesirable "black bone" effect; ground beef had significant variance in fat content; high bacteria counts were detected in several shipments of natural cheese; bakery mixes were noted to be of inferior quality for central production; and most container sizes were too small for efficient operations within the central facility.

12. A continuous problem of actual yield versus anticipated yield was encountered but for the most part was correctable. Some variances resulted from the kettles not being level and a different volume measurement would be obtained depending on which side of the kettle the readings were taken. It was also discovered that vibrations caused the cake depositor setting to change during production. Consequently, cake pans were filled at a decreasing weight resulting in an apparent excess or variance from the expected yields.

13. The planning, scheduling, and control system was not adequate to guide central production due primarily to lack of automation and the inability of the manual system to react to initial over-production, long lead times for supply reorders, due-outs, and unsatisfactory substitutions by the supply system. The lag time between Menu Board decision, production forecast, supply requisition, production scheduling, and actual production was in some cases over sixty days. Therefore, modification of any of the myriad factors affecting the production cycle was not apparent in either the type or quantity of finished product until long after initial change was instituted. Failure to recognize this aberration resulted in the appearance of inefficiency and, in some instances, overreaction based on changing requirements.

14. A program to rotate dining facility cooks through the CFPF for training was not implemented during the short evaluation period. This was due to the requirement for at least thirty to sixty days training time for the individuals to make a significant contribution. This factor plus the limited number of dining facility cook personnel who could be made available for training prohibited the program from being initiated.

15. The procedures established to account for subsistence transferred between the TISA and CFPF were adequate. In addition, there was no impact on the installation stock fund resulting from the CFPS. Equally important, the only operational impact on the Army Ration Credit System (ARCS) was that food service sergeants were not allowed to deviate from the installation master menu in the ordering of CFPF entree items.

16. Detailed analyses of equipment and the packing and packaging systems, which address performance, shortcomings, reliability, and preference, are included in the report presented at Annex D. (These analyses conducted on

a line item basis are lengthy in nature, and for that reason are not reiterated here.)

17. The Directorate of Food Management concluded that the evaluation of the CFPS was conducted prior to the attainment of a "steady-state" of operations and recommended that the CFPS be reevaluated in early 1979. (This recommendation was predicated on the reappraisal of several factors relating to the CFPS to include: staffing skills and levels; additional equipment; reassessment of the requirement to adhere to the 42-day master menu; addition of a product development capability; reassessment of the complete packaging system; design of a planning scheduling and control system; and a review of the Military Subsistence Supply System.)

E. FOOD SERVICE WORKER, COMMANDER, AND CUSTOMER OPINION OF CENTRAL FOOD PREPARATION:

1. The NARADCOM Food Sciences Laboratory (FSL) developed and administered a comprehensive program to ascertain perceptions and attitudes of Army personnel relative to the central food preparation and central food management concepts. The methodology consisted of three phases, pre-CFPF evaluations at Fort Lee and Fort Carson and a post-CFPF evaluation at Fort Lee. This program was structured to obtain a composite profile of statistically representative opinions from the three categories of personnel concerned with garrison feeding operations - food service personnel, commanders, and customers/diners. On-site interviews were conducted by FSL representatives and specially designed questionnaires were distributed and collected which required written responses by both food service personnel and customers. Results of this program will provide the data necessary to identify both positive and negative motivational factors attributable to the CFPS program for use in the development of affirmative CFPS motivation techniques, literature, and training programs.

2. Central Food Management: Interviews with company, battalion, and brigade commanders indicated a preference for continuation of conventional decentralized management (command) of the food service function. Commanders were concerned about the potential loss in influence over the dining facility which would result in a consolidation of food service operations under the Central Food Management Concept. Although commanders perceived that centralized management would save money and relieve the unit commander of an administrative concern, they feared a loss of responsiveness in food service, poorer quality food, and a negative influence on unit morale. They were concerned also about problems related to field feeding requirements. Cook personnel also preferred conventional decentralized management, but not as strongly as the company, battalion, and brigade commanders. The concept of central management was most popular with cooks at Fort Carson, a post where it does not exist, because it was generally believed that centralization would result in having only one boss. Fort Lee cooks working under a central manager revealed a minor shift in opinion towards central management (reflective of an opinion change in the civilian cook population only) with the most frequent complaint being that there were too many bosses under centralized management. Fort Lee cooks responded favorably to the

professionalism exhibited by DFM personnel, the greater uniformity in food service operations, and to the DFM's ability to reassign cooks from one dining facility to another as needed.

3. Central Food Preparation:

a. Cooks and unit commanders at both Fort Carson and Fort Lee indicated strong preferences for continuing to prepare food in the dining facilities as opposed to central food preparation. In the pre-CFPF surveys, approximately 65% of the cooks favored local preparation while the post-CFPF surveys at Fort Lee revealed that over 70% of the cooks preferred food preparation in the dining facility after experiencing/using centrally prepared foods. Fort Carson commanders overwhelmingly preferred retention of local food preparation in the dining facilities while Fort Lee commanders for the most part maintained a neutral or "wait and see" attitude towards central food preparation during the pre-CFPF surveys. Post-CFPF analysis, however, disclosed a preference of over 70% for local preparation by the Fort Lee commanders - closely paralleling cook personnel preferences.

b. The main disadvantages of CFPF cited in the pre-test by both cooks and commanders included decreased food quality, lack of on the job training for cooks and going to the field. Cooks were also concerned with reheating items instead of cooking from "scratch" and anticipated an increase in customer complaints about food that the Central Kitchen, not they, had prepared. During the Fort Lee post-CFPF survey, cooks also reported that some food items were overcooked, that there were too few cooks, that dining facility cooks were not rotated through the central kitchen for training, and that the CFPF did not always supply requested items. The main advantages seen in central preparation by both groups included savings in money, time, and personnel. Fort Lee commanders and cooks also recognized the utility of the Ingredient Preparation Area function.

c. Approximately two-thirds of the customers surveyed at Fort Carson and Fort Lee indicated a preference for locally prepared foods citing food quality and inherent dislike of frozen foods.

4. The detailed findings/results of this portion of the evaluation are attached at Annex E.

F. CONSUMER OPINION MEASUREMENT:

1. Consumer opinion surveys were conducted to measure whether or not the diner perceived any significant differences between foods prepared in the dining facility (on-site) and in the CFPF. The survey was administered in dining facilities for selected foods with each food item being surveyed when it was prepared on-site and again when the CFPF prepared item was served. The on-site preparation surveys were conducted from mid-November 1977 through mid-February 1978. The centrally prepared surveys were performed during May through mid-July 1978. The surveys were accomplished by handing opinion cards to diners who had the test food item on their trays as they came from the

serving line. The survey cards were collected from the diners after they had completed their meal. Next, the diners' responses were keypunched on cards, and both the consumer opinion cards and ADP cards were forwarded to the Behavioral Sciences Division, NARADCOM, for statistical analysis and tabulation of comments. The NARADCOM analysis of the consumer opinion cards revealed that of the 24 foods surveyed, 16 on-site prepared foods rated better than CFPF items. Five of the CFPF prepared foods rated better than on-site prepared, and three foods were virtually identical in acceptability. Ten CFPF items were resurveyed in Sep 78 with similar results to those described above. Examination of the actual ratings by the consumer shows that neither the on-site preparation nor the centrally prepared foods were rated negatively. Both modes of preparation yielded acceptable products with most on-site products scoring slightly higher than centrally prepared products.

2. The detailed findings/results of the consumer opinion measurement are attached at Annex F.

G. QUALITY CONTROL/QUALITY ASSURANCE:

1. The Technical Support Office (TSO) was established within the Fort Lee Directorate of Food Management (DFM) to administer the CFPS quality control (QC) and quality assurance (QA) programs. The organization consisted of three functional elements; Inspection, Laboratory, and Internal Sanitation. The personnel in this office worked for the DFM, but the Laboratory and Inspection personnel were carried on the TDA of the Fort Lee MEDDAC. The MEDDAC Commander retained ultimate responsibility for QA, although the personnel resources to accomplish this function were assigned to the DFM for the operation and control of the QC/QA program. The TSO was primarily concerned with QA responsibilities relative to CFPS food wholesomeness and exercised positive control over the risk associated with food-borne illness. Quality control functions relating to the esthetic and physical characteristics of the food, although critical to the success of the CFPS, were considered by the TSO to be subordinate to the requirement to insure food wholesomeness.

2. The effectiveness of the TSO was limited by a lack of timely managerial emphasis in establishing effective production control procedures and by an extensive delay in recognizing the need to provide close supervision over the activities of the TSO. It was only during the months of August and September 1978 that the TSO began to exert a positive influence over the actions taken by the Central Food Preparation Division. The level of influence attained did demonstrate that adequate provisions for QC are essential to assure successful operation of the CFPS. The TSO did not significantly influence the functions of the Dining Facility Operations Division during the evaluation.

3. The inspection function of the TSO provided the on-site surveillance of production techniques, sanitation, technical assessments of food quality, and the verification of ingredient weights, measures, and composition. The staff of two Veterinary Food Inspectors (MOS 91R) and one Preventive Medicine Specialist (MOS 91S) was not considered adequate to provide the necessary surveillance required by the Fort Lee CFPS. Also, extreme difficulty was encountered by these individuals in relating their past military experience to the QC functions required in a CFPS.

4. The Laboratory function of the TSO was established primarily for microbiology analysis and operated to detect and enumerate human pathogenic organisms and other organisms that are indicators of filth and contamination. This activity operated satisfactorily in controlling the wholesomeness of centrally prepared foods.

5. A sensory panel was established by the TSO and trained by NARADCOM Food Science Laboratory personnel in food sensory techniques. The results of the panel's efforts were used to "fine tune" CFPF production in terms of the food quality. The feedback data generated by the panel enabled CFPF management to make considerable improvement in the formulation and preparation of centrally prepared items (see User Evaluation at Annex D).

6. It was concluded that:

a. Large scale centralized food preparation poses a significant health risk, but this risk of food-borne illness can be and was controlled during the evaluation.

b. Large scale centralized food preparation requires a positive and reliable feedback system to control the esthetic and physical quality of the foods, and this can be accomplished by a sensory panel.

7. Finally, it was recommended that:

a. Medical authority, not the operator, should be responsible for inspection coverage of the CFPF and determining food wholesomeness.

b. The esthetic and physical quality of the centrally prepared foods should be the responsibility of the operator of the CFPF (but separated from production).

8. The detailed findings/results of this evaluation are attached at Annex G.

H. FIELD FEEDING INTERFACE:

1. The field feeding evaluation was conducted to determine the feasibility of using Central Food Preparation Facility products to support peacetime field feeding requirements. Until this evaluation, neither the advantages nor the type of problems associated with feeding CFPF products in the field were actually known even though some were foreseen. For this reason, the evaluation was conducted in two phases. Both phases involved the participation of a TO&E company and were conducted during the period 8-10 May 1978 and 25-28 September 1978 at Fort Pickett, Virginia.

2. During the first phase, the unit's normal ration requirements were supplemented with fifteen CFPF products. Although it was closely controlled, this phase provided encouraging results and gave a strong indication that CFPF products could be handled and reconstituted successfully in the field with TO&E food service equipment. In the second phase, the evaluation

parameters were "free play" rather than controlled by the evaluators. The company food service sergeant developed the menu which was primarily CFPF products, requested and drew the desired items (twenty-three CFPF products) through normal procedures, and transported them to the field where they were reconstituted and served to the soldiers. During this four-day evaluation, it was demonstrated that CFPF products not only could be handled and reconstituted successfully in the field, but they could also increase efficiency by reducing labor requirements and improving sanitation conditions. Acceptability of CFPF products also appeared high.

3. The detailed findings/results of both phases of the field feeding evaluation are attached at Annex H.

I. MOBILIZATION IMPACT:

1. A study was conducted to determine whether an existing CFPF could be expanded on a timely basis to provide subsistence support to mobilized forces. This study was performed by TSA personnel applying current knowledge gained from the Fort Lee CFPF and realistic projections of what could reasonably be expected at an installation with a permanent CFPF during mobilization.

2. The results of the study indicated that an existing CFPF could be expanded substantially by increasing the CFPF labor force, extending the work week to multiple shifts, and/or simplifying the master menu to emphasize basic menu items which lend themselves to high volume central production. The operation of a CFPF would also reduce the total number of food service personnel required at the mobilization station and would help compensate for any lack of experienced/trained cooks at the time of mobilization. Finally, it was concluded that a CFPF would not solve all the existing food preparation problems during mobilization, but would provide a viable and responsive capability for rapid transitional food service support expansion.

3. The mobilization impact study is attached at Annex I.

J. ORGANIZATION/MANAGEMENT STRUCTURE:

1. A study was conducted to determine whether the Directorate of Food Management (DFM), as established at Fort Lee, VA, is required to manage and control a Central Food Preparation System (CFPS). The Directorate level management structure was addressed as well as an alternative to this organization. Since it was determined that the management and control of a CFPS must be at installation level, two viable alternatives for controlling a CFPS were identified:

a. Establish a Directorate of Food Management (DFM) similar to that operating at Fort Lee, VA.

b. Establish a Central Food Preparation Branch in the Services Division of the Directorate of Industrial Operations (DIO).

2. At Fort Lee, the authority of the DFM embodies all garrison troop food service activities except the hospital. The Director is on the same staff level as other installation Directors. The DFM actually operates the Troop Issue Subsistence Activity (TISA), Central Food Preparation Facility (CFPF), Technical Support Office, and TDA and TOE dining facilities. This organization and management structure has proven that a CFPS must be managed and controlled at installation level for effective operation. The dining facilities and Troop Issue Subsistence Activity must interface with the CFPF and the Fort Lee DFM organization has provided the required interface. This was partly assisted by total control over operating dining facilities.

3. Another means of controlling and managing a CFPS is to establish a Central Food Preparation Branch in the Services Division of the DIO. This alternative will also provide total centralized direction, control, interface, and management for a CFPS except for actually operating dining facilities. The Chief of the Services Division would be responsible for all food related functions including operating the TISA and CFPF while providing centralized direction (advice and assistance rather than operation control) of TDA and TOE dining facilities. Since Army installations, where a CFPF would be proliferated, have Services Divisions, the disruption normally associated with organizational changes would be minimal for this alternative, as compared to establishing new Directorate level management. The organization and management structure of the Services Division will provide the necessary centralized direction, control, and interface to efficiently and effectively manage and operate a CFPS on an installation without establishing separate Directorate level management.

4. See Annex J for a detailed discussion of the Organization and Management structure required to manage and control a CFPS.

PROPOSED STAFFING FOR CONVENTIONAL DFB

<u>RATIONS</u>	<u>E8</u>	<u>E7</u>	<u>E6</u>	<u>E5</u>	<u>E4</u>	<u>E3</u>	<u>WL8</u>	<u>WG8</u>	<u>WG6</u>	<u>WG5</u>	<u>SUB-TOTAL</u>	<u>WL1</u>	<u>WG1</u>	<u>TOTAL</u>
0-120	0	1	1	2	1	1	1	0	0	1	8	1	5	14
121-145	0	1	1	2	1	1	1	1	0	1	9	1	6	16
146-170	0	1	1	3	1	1	1	1	0	1	10	1	6	17
171-197	0	1	1	3	1	1	1	1	1	1	11	1	8	20
198-223	0	1	1	3	2	1	1	1	1	1	12	1	8	21
224-251	0	1	1	3	2	1	1	1	1	2	13	1	9	23
252-279	0	1	1	3	2	1	1	1	2	2	14	1	10	25
280-307	0	1	1	3	2	2	1	1	2	2	15	1	11	27
308-336	0	1	1	3	2	2	1	2	2	2	16	1	12	29
337-365	0	1	1	3	2	2	1	2	2	3	17	1	13	31
366-395	0	1	1	3	3	2	1	2	2	3	18	1	14	33
396-422	0	1	1	3	3	2	2	2	2	3	19	1	15	35
423-457	0	1	1	3	4	2	2	2	2	3	20	1	16	37
458-489	0	1	1	4	4	2	2	2	2	3	21	1	16	38
490-522	0	1	1	4	4	2	2	2	3	3	22	1	17	40
523-556	0	1	1	4	4	2	2	3	3	3	23	1	18	42
557-590	0	1	1	4	4	2	2	3	3	4	24	1	19	44
591-624	0	1	1	4	4	2	2	3	4	4	25	1	20	46
625-659	0	1	1	4	5	2	2	3	4	4	26	1	22	49
660-695	1	1	1	4	5	2	2	3	4	4	27	1	23	51
696-731	1	1	1	4	5	2	2	3	4	5	28	1	24	53
732-767	1	1	1	4	5	2	2	3	4	6	29	1	25	55
768-805	1	1	1	4	5	2	2	3	5	6	30	1	26	57
806-843	1	1	1	4	5	2	2	4	5	6	31	1	26	58
844-881	1	1	1	5	5	2	2	4	5	6	32	1	27	60
882-921	1	1	1	5	5	2	2	4	6	6	33	1	29	63

PROPOSED STAFFING FOR CFPF SDFs at 30% CSL

(Number of WL1, WG1 employees same as in Tab B, Section III)

RATIONS	E8	E7	E6	E5	E4	E3	WL8	WG8	WG6	WG5	TOTAL
0-145	0	1	1	1	1	1	1	0	0	1	7
146-197	0	1	1	1	1	1	1	1	0	1	8
198-251	0	1	1	2	1	1	1	1	0	1	9
252-307	0	1	1	2	1	1	1	1	1	1	10
308-365	0	1	1	2	2	1	1	1	1	1	11
366-422	0	1	1	2	2	1	1	1	1	2	12
423-489	0	1	1	2	2	1	1	1	2	2	13
490-556	0	1	1	2	2	1	1	2	2	2	14
557-624	0	1	1	2	3	1	1	2	2	2	15
625-695	1	1	1	2	3	1	1	2	2	2	16
696-767	1	1	1	2	3	1	1	2	2	3	17
768-843	1	1	1	2	3	1	2	2	2	3	18
844-921	1	1	1	2	3	1	2	2	3	3	19

PROPOSED STAFFING FOR CFPF SDFs at 50% CSL

(Number of WL1, WG 1 employees same as in Tab B, Section III)

RATIONS	E8	E7	E6	E5	E4	E3	WL8	WL8	WG6	WG5	TOTAL
0-157	0	1	1	1	1	1	1	0	0	1	7
158-223	0	1	1	1	1	1	1	1	0	1	8
224-293	0	1	1	2	1	1	1	1	0	1	9
294-365	0	1	1	2	1	1	1	1	1	1	10
366-440	0	1	1	2	2	1	1	1	1	1	11
441-552	0	1	1	2	2	1	1	1	1	2	12
523-607	0	1	1	2	2	1	1	1	2	2	13
608-695	1	1	1	2	2	1	1	1	2	2	14
696-787	1	1	1	2	2	1	1	2	2	2	15
788-881	1	1	1	2	3	1	1	2	2	2	16
882-977	1	1	1	2	3	1	1	2	2	3	17

AUTHORIZED STAFFING

<u>GRADE</u>	<u>FORT CARSON (24 DF's @ 10,841 MPD)</u>	<u>FORT LEWIS (38 DF's @ 16,362 MPD)</u>	<u>*FORT KNOX (49 DF's @ 19,829 MPD)</u>
E8	0	1	0
E7	102	104	73
E6	123	118	80
E5	200	184	101
E4	149	257	157
E3	134	107	102
WL8	0	0	21
WG8	0	0	35
WG6	0	0	0
WG5	0	0	10
E2	0	4	6
E1	<u>0</u>	<u>1</u>	<u>1</u>
TOTAL	<u>708</u>	<u>776</u>	<u>586</u>

*Excludes four (4) contract operated DF's.

ASSIGNED STAFFING

<u>GRADE</u>	<u>FORT CARSON</u> (24 DF's @ 10,841 MPD)	<u>FORT LEWIS</u> (38 DF's @ 16,362 MPD)	<u>*FORT KNOX</u> (49 DF's @ 19,829 MPD)
E8	1	6	3
E7	69	81	72
E6	126	116	75
E5	109	171	156
E4	200	205	183
E3	180	210	69
WL8	0	0	21
WG8	0	0	35
WG6	0	0	0
WG5	0	0	10
E2	71	123	58
E1	<u>11</u>	<u>16</u>	<u>4</u>
TOTAL	<u><u>847</u></u>	<u><u>928</u></u>	<u><u>686</u></u>

*Excludes four (4) contract operated DF's.

PERSONNEL AND COSTS (\$1000)

Annual cost of personnel:

SUMMARY OF (COSTS) & SAVINGS IN THOUSANDS OF DOLLARS											
										FOR CSL = 30	
ACTIVITY	MPO	SUPPLY COSTS	% FOOD SAVINGS	CAPITAL	CFPF STAFFING	SDF STAFFING	FOOD	UTIL AND M&R	SUPPLIES	TRANSPOR-TATION	TOTAL
FT LEE	6,250	HIGH	10	(913)	(709)	469	62	(152)	(91)	-	(1334)
			15	"	"	"	95	"	"	-	(1301)
			20	"	"	"	129	"	"	-	(1267)
		LOW	10	"	"	"	62	"	(47)	-	(1290)
			15	"	"	"	95	"	"	-	(1257)
			20	"	"	"	129	"	"	-	(1223)
FT CARSON	10,841	HIGH	10	(926)	(836)	711	110	(164)	(154)	-	(1259)
			15	"	"	"	170	"	"	-	(1199)
			20	"	"	"	230	"	"	-	(1139)
		LOW	10	"	"	"	110	"	(78)	-	(1183)
			15	"	"	"	170	"	"	-	(1123)
			20	"	"	"	230	"	"	-	(1063)
FT LEWIS	16,362	HIGH	10	(1166)	(1171)	1054	166	(125)	(232)	-	(1474)
			15	"	"	"	256	"	"	-	(1384)
			20	"	"	"	346	"	"	-	(1294)
		LOW	10	"	"	"	166	"	(118)	-	(1360)
			15	"	"	"	256	"	"	-	(127)
			20	"	"	"	346	"	"	-	(1180)
FT KNOX	23,384	HIGH	10	(1180)	(1351)	1397	236	(285)	(330)	-	(1513)
			15	"	"	"	365	"	"	-	(1384)
			20	"	"	"	493	"	"	-	(1256)
		LOW	10	"	"	"	236	"	(167)	-	(1350)
			15	"	"	"	365	"	"	-	(1221)
			20	"	"	"	493	"	"	-	(1093)
REGION I	44,962	HIGH	10	(1481)	(1975)	3361	456	(562)	(631)	(289)	(1121)
			15	"	"	"	704	"	"	"	(873)
			20	"	"	"	952	"	"	"	(625)
		LOW	10	"	"	"	456	"	(317)	"	(807)
			15	"	"	"	704	"	"	"	(559)
			20	"	"	"	952	"	"	"	(311)
REGION II	60,782	HIGH	10	(1507)	(2179)	4616	616	(703)	(850)	(339)	(346)
			15	"	"	"	952	"	"	"	(10)
			20	"	"	"	1287	"	"	"	325
		LOW	10	"	"	"	616	"	(426)	"	78
			15	"	"	"	952	"	"	"	414
			20	"	"	"	1287	"	"	"	74

Tab G, Section III

SUMMARY OF (COSTS) & SAVINGS IN THOUSANDS OF DOLLARS

FOR CSL = 50 %

ACTIVITY	MPD	SUPPLY COSTS	% FOOD SAVINGS	CAPITAL	CFPF STAFFING	SDF STAFFING	FOOD	UTIL AND M&R	SUPPLIES	TRANSPOR-TATION	TOTAL
FT LEE	6,250	HIGH	10	(912)	(918)	523	103	(190)	(148)	-	(1542)
			15	"	"	"	159	"	"	-	(1486)
			20	"	"	"	215	"	"	-	(1430)
		LOW	10	"	"	"	103	"	(76)	-	(1470)
			15	"	"	"	159	"	"	-	(1414)
			20	"	"	"	215	"	"	-	(1358)
FT CARSON	10,841	HIGH	10	(927)	(1011)	824	184	(219)	(254)	-	(1403)
			15	"	"	"	284	"	"	-	(1303)
			20	"	"	"	384	"	"	-	(1203)
		LOW	10	"	"	"	184	"	(128)	-	(1277)
			15	"	"	"	284	"	"	-	(1177)
			20	"	"	"	384	"	"	-	(1077)
FT LEWIS	16,362	HIGH	10	(1167)	(1387)	1130	276	(146)	(384)	-	(1678)
			15	"	"	"	427	"	"	-	(1527)
			20	"	"	"	577	"	"	-	(1377)
		LOW	10	"	"	"	276	"	(193)	-	(1487)
			15	"	"	"	427	"	"	-	(1336)
			20	"	"	"	577	"	"	-	(1186)
FT KNOX	23,384	HIGH	10	(1179)	(1675)	1544	394	(404)	(546)	-	(1866)
			15	"	"	"	608	"	"	-	(1652)
			20	"	"	"	823	"	"	-	(1437)
		LOW	10	"	"	"	394	"	(274)	-	(1594)
			15	"	"	"	608	"	"	-	(1380)
			20	"	"	"	823	"	"	-	(1165)
REGION I	44,962	HIGH	10	(1506)	(2393)	3776	760	(829)	(1046)	(399)	(1637)
			15	"	"	"	1174	"	"	"	(1223)
			20	"	"	"	1588	"	"	"	(809)
		LOW	10	"	"	"	760	"	(523)	"	(1114)
			15	"	"	"	1174	"	"	"	(700)
			20	"	"	"	1588	"	"	"	(286)
REGION II	60,782	HIGH	10	(1542)	(2674)	5306	1027	(1065)	(1412)	(486)	(846)
			15	"	"	"	1586	"	"	"	(287)
			20	"	"	"	2145	"	"	"	272
		LOW	10	"	"	"	1027	"	(704)	"	(138)
			15	"	"	"	1586	"	"	"	421
			20	"	"	"	2145	"	"	"	980

STAFFING SUMMARY FOR VARIOUS SIZED CFPF'S

DESCRIPTION	PAR.	MEALS/DAY							
		25-30K		15.6K		10.5K		6.6K	
		OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW
Ofc of Dir	01	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>
Ofc Sub Total	0	3	3	3	3	3	3	3	3
Tech Spt Ofc	02	2	(2)	2	(2)	(2)	(2)	(1)	(1)
QC Micro Br	02A	9	(8)	8	(7)	(7)	(6)	(7)	(6)
Internal San Br	02B	<u>11</u>	<u>0</u>	<u>10</u>	<u>0</u>	<u>(8)</u>	<u>(0)</u>	<u>(8)</u>	<u>(0)</u>
Ofc Sub Total	(A11 CFPF)	22	10	20	9	17	8	16	7
Support Div	03	11	10	9	8	8	7	(8)	(7)
Training Br	03B	6	4	4	3	3	2	<u>(1)</u>	<u>(1)</u>
Sub-Sub Total		-	-	-	-	-	-	9	8
Troop Is Subs Br	03A	<u>40</u>	<u>37</u>	<u>35</u>	<u>33</u>	<u>29</u>	<u>27</u>	<u>24(29)*</u>	<u>23(28)*</u>
Div Sub Total		57	51	48	44	40	36	33	31
Chargeable to CFPF		12(3+ 6+3)	7(2+ 4+1)	7(1+ 4+2)	5(1+ 3+1)	5(0+ 3+2)	3(0+ 2+1)	3(0+ 1+2)	2(0+ 1)
Dining Facilities Division	04	Not Considered Here							
Central Food Div	05	<u>6</u>	<u>6</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>
Ofc Sub Total		6	6	5	5	4	4	4	4
Food Prep Br	05A	3	3	2	2	(1)	(1)	(1)	(1)
Ingred Scaling Sec	05B	3	3	2	2	(2)	(2)	(2)	(2)
Veg/Salad Sec	05C	17	12	8	8	<u>(8)</u>	<u>(7)</u>	<u>(8)</u>	<u>(6)</u>
Br Sub Total		-	-	-	-	11	10	11	9
Main Kit Sec (Br last 2)	05E	14	12	10	10	(9)	(8)	(9)	(7)
Dessert Sec	05D	9	8	8	7	(7)	(6)	(6)	(5)
Packaging Sec	05F	8	6	5	4	(5)	(4)	(5)	(3)
Equip Wash Sec/San	05G	3	10	2	8	(2)	(6)	(2)	(5)
Rec/Stor/Dist Br	05H	7	<u>5</u>	5	<u>3</u>	<u>(2)</u>	<u>(2)</u>	<u>(2)</u>	<u>(2)</u>
Br Sub Total		-	<u>41</u>	-	<u>32</u>	<u>25</u>	<u>26</u>	<u>24</u>	<u>22</u>
Div Sub Total	(A11 CFPF)	70	65	47	49	40	40	39	35
CFPS TOTAL (W/O DF's)		152	129	118	105	100	87	91	76
Total Attributable to CFPF		104	82	74	63	62	51	58	44

() Not a separate element but identified with the function.

() *Now at Fort Lee but 5 are at satellite bases.

Tab I, Section III

SECTION IV

SUMMARY

The primary objective of the Central Food Preparation System (CFPS) is to provide a high quality meal to the soldier while reducing the expenditures of overall food service resources. To validate this objective, the Army constructed, operated, and evaluated the interim Central Food Preparation Facility (CFPF) and related activities at Fort Lee, VA.

The CFPS is a complex and multifaceted troop support system. Numerous changes were required to conventional food service policies, procedures, and operational techniques. New and markedly different facilities, equipment, and technological demands were imposed on and integrated into the Fort Lee food service program. This necessitated new and sometimes innovative requirements unique to the CFPS in management philosophy, accounting, menu planning, food preparation, packaging, reconstitution and serving, quality control, warehousing, inventory control, maintenance, job/task/skill realignments, staffing, training, and motivation. Such diverse demands on the various Fort Lee system operators, interacting within the evaluation time constraints, provided a most unusual and challenging evaluation vehicle. The separate subevaluations previously addressed were necessary to properly isolate the significant elements and operational characteristics of the CFPS in such a manner that the results of these separate evaluations, when integrated, provided a rational, reliable, and accurate evaluation of the CFPS.

The Fort Lee user/operator evaluation report and the NARADCOM Food Engineering Laboratory (FEL) report collectively isolate, identify, and detail myriad operational problems and deficiencies with the CFPS as evaluated. The very nature of these evaluation reports serve to emphasize the system's negative aspects to assure that appropriate corrective actions are taken where practical and to highlight undesirable or questionable conditions which require further management action/consideration. Rather than detracting from or clouding the evaluation, these findings offer extremely positive measures of the current or evaluated status of the CFPS and give valuable insight into the operational capabilities and potential problem areas of future CFPS's. As expected, many of the discrepancies described have been resolved; however, several crucial problems are as yet unresolved. As suggested in these reports, it would seem most prudent to continue to evaluate the Fort Lee CFPS to assure that the CFPS is fully evaluated in a basically steady-state condition with all elements of the CFPS functioning as closely to the design concept as practical. This would, however, require an extensive, expensive, and time consuming rescope and redesign of the recognized design limitations of the interim CFPS facilities and equipment at Fort Lee. Further evaluation would be considered practical only if the other CFPS subevaluations (Economic Analysis, Personnel Attitudes toward Central Food Preparation, Consumer Food Acceptance, and Work Sampling)

were extremely positive and provided strong or possibly even borderline support for proliferating the CFPS concept. The function, operational simplicity and recognized usefulness of the Ingredient Preparation Branch, however, is such that it appears that it may be readily adopted to support an installation's food service program. Additional study and evaluation is definitely indicated to further explore its application.

Command, cook, and consumer attitudes have been determined to be negative towards the CFPS. Consumer acceptance of CFPF prepared products has been found to be slightly below acceptance levels for like dining facility prepared items. Within a relatively short time, a large number of items were introduced by a new organization into a new and less than optimally designed facility. The trauma of starting-up of a new system with new personnel skill requirements and unfamiliar assignments to satisfy evaluation program requirements did not relieve the responsibility of fully satisfying the basic food service mission requirement at Fort Lee. In this environment, consumer acceptance of CFPF prepared items must be viewed quite favorably. Improved management and production control in consonance with an effective quality control program, and continued support from NARADCOM directed towards improving operating guides, should provide a high level of CFPF product quality and acceptance. The NARADCOM work sampling survey results indicate that the CFPS staffing levels are adequate, except for overstaffing in the CFPF. The operator, on the other hand, indicates a need for upgrading specific skill levels in the CFPF and generally increasing staffing levels in the dining facilities which would further degrade the economic prospects of the CFPS.

The CFPS interface and/or compatibility of garrison and peacetime field feeding requirements was found to be satisfactory. Also, the CFPS is projected to afford very positive benefits in the event of mobilization.

The most negative aspect evidenced from the CFPS evaluation is that of economics. Put simply, projected food cost savings (not substantiated during the Fort Lee CFPS evaluation) and proven reductions in CFPS satellite dining facility staffing are not sufficient to offset the capital, operating, and personnel costs incurred in the operation of a CFPF at any of the four CONUS installations analyzed. Although marginal cost benefits are portrayed for the more optimistic operational conditions for one of the two regional CFPS complexes analyzed, the nominal savings projected are not considered significant. The extremely preliminary "rough-cut" nature of the data used, the logistical problems that would be incurred in such multi-installation complexes, and the practicality of realizing real cost savings in a combined services working arrangement, diminish the practicality of the projected savings. It should be emphasized that earlier economic analyses, which indicated significant cost benefits for the CFPS, were based principally on "soft" data and were representative of CONUS Army installation food service programs as they existed in the early 70's. Mission changes have since occurred in the areas of consolidation, modernization, and new construction of Army dining facilities to reduce significantly the number of dining facilities currently in use or planned - thereby greatly reducing the

potential for corresponding personnel savings under the CFPS evaluation. These changes have impacted at most CONUS installations to include the four representative CONUS garrison installations selected and analyzed. Consequently, the projected economic viability of the CFPS, even for the most optimistic system operational conditions and parameters identified, was not obtainable. Control of the most obvious and costly decrement to the Army's CONUS food service program - Readiness Costs - was beyond the scope of this evaluation for either CFPS or conventional feeding systems. The extreme magnitude of these added costs for Forts Carson, Knox, and Lewis alone, dictates that serious consideration be given to viable alternatives to assure more efficient peacetime utilization while continuing to support the Army feeding mission.

The pronounced negative attitudes toward the CFPS combined with the depressing economics evidenced thoroughly discourage further attempts to improve, refine, perfect, and evaluate the CFPS. Even if management and operational controls were fully perfected, proper equipment and supplies were used in a reconfigured CFPF, recipe formulations were optimized to provide consistently uniform quality products, and fully trained personnel with food production experience were available and effectively utilized, it is predicted that TO&E command and cook opinions would remain negative and the CFPS still would not offer an economically viable installation food service system for the Army.

SECTION V

CONCLUSIONS

1. That the CFPS evaluation provided those data and experiences necessary to assess the economic impact, operational viability, and systems compatibility of the CFPS in support of the Army's food service mission.
2. That the CFPS is not a cost effective food service system at the installation level.
3. That the cost efficiencies projected for Regional Area CFPS complexes (both for Army and multi-service regions) are derived from optimistic interpretations of "soft" or preliminary data. The relatively insignificant potential cost benefit to the Government is not worthy of further serious consideration when weighed against prevailing negative percepts and attitudes, investment requirements, requisite job/task/skill deficiencies, complexity of logistical and managerial criteria, and the inherent mission/service incompatibilities that would frustrate the successful application of the Regional CFPS concept.
4. That the energy consumption analysis is incomplete but should be completed for other purposes.
5. That the ingredient preparation function may be beneficial as a separate activity.
6. That, although work measurement surveys indicate that TDA staffing for dining facilities supported by CFPF during the evaluation is adequate, the operator experienced numerous critical problems while attempting to accomplish the dining facility mission at the approved TDA staffing levels.
7. That central food production is a complex and multi-faceted operation and that key management personnel with intimate knowledge and experience in high volume food production are not readily available within military/civil service assets. The absence of fully qualified managerial personnel with proven backgrounds in central food production resulted in CFPF operational methodologies and techniques being closely attuned to conventional dining facility practices. Lack of these crucial talents seriously limited efforts to stabilize and maintain an efficient central food preparation capability.
8. That commanders, cooks, and customers prefer conventional dining facility food preparation methods as opposed to the central food preparation concept.

9. That consumer opinion surveys indicate a preference for conventionally prepared products over CFPP prepared products.

10. That CFPP products are suitable for supporting peacetime Field Feeding requirements.

11. That extensive professional Quality Control and Quality Assurance programs are essential to the central food preparation concept.

12. That an existing CFPP could expand production substantially to support mobilization forces.

13. That a Directorate-level Central Food Management organization is not required to operate and manage a Central Food Preparation Facility. This function can be effectively accomplished by a Division of the Directorate of Industrial Operations.

SECTION VI

RECOMMENDATIONS

1. That the CFPF not be proliferated.
2. That the Fort Lee CFPF be phased out.
3. That the Ingredient Preparation Activity be reviewed by Fort Lee and TSA for consideration as a command option.
4. That the Energy Consumption Evaluation be completed.

ANNEX A

ECONOMIC ANALYSIS

OPERATION RESEARCH/SYSTEM

ANALYSIS OFFICE

NARADCOM

AN ECONOMIC EVALUATION OF THE
CENTRAL FOOD PREPARATION FACILITY
CONCEPT

A REPORT PREPARED FOR:

OPERATIONS RESEARCH AND SYSTEMS ANALYSIS OFFICE
U.S. ARMY NATICK RESEARCH AND DEVELOPMENT COMMAND

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ABSTRACT

This report compares the differences in annual operating costs between conventional garrison food systems and central food preparation facilities (CFPFs) for:

- Ft. Lee, Virginia,
- Ft. Carson, Colorado,
- Ft. Lewis, Washington,
- Ft. Knox, Kentucky, and
- Two regions consisting of U.S. Military Posts located within 200 miles of Ft. Lee
 - Region I consisting of nine Army Posts serving about 45,000 meals per day
 - Region II consisting of seventeen Military Posts serving about 61,000 meals per day

The incremental capital investment costs, operating costs and work force requirements of the CFPF for each of the above Forts or Regions are discussed and compared to the conventional system.

It is concluded that the CFPF offers cost benefits only in the case of Region II and that the CFPF concept is not economically viable with the current design and staffing configuration. Further, readily apparent alterations to the system operations that would produce cost savings of the magnitude required have not been identified.

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I. INTRODUCTION

Earlier preliminary economic analyses [1, 2, 3] have indicated a potential for substantial cost savings through utilization of a Central Food Preparation Facility (CFPF). A prototype CFPF system was designed and constructed at Ft. Lee, Virginia through modifications of existing buildings. In March of 1978 production began to support a set of eight satellite dining facilities (SDFs). Cost data collected during this experiment and from Forts Carson, Lewis and Knox are utilized in this report to evaluate the general economic viability of the CFPF concept. Additionally, pertinent cost data have been obtained to include a "rough cut" analysis of the regional CFPF concept.

A comparative cost analysis between the CFPF and the conventional system is used. Ft. Lee has operated in a partial CFPF mode for several years while all other military bases for which data were obtained operate as conventional systems.

In a conventional system some raw food is sent directly to dining facilities (DFs) from local vendors. However, most of it is provided to the DFs from the Troop Issue Subsistence Activity (TISA). Each DF performs the full range of functions required to transform raw food into finished meals.

The Ft. Benning, Georgia, concept design for a CFPF system (1974) is for new, permanent construction and includes a TISA, ingredient, preparation (IP) section, a central kitchen (CK) branch, a microbiological laboratory, and other support functions within a single complex. The IP obtains raw food from TISA and prepares both the basic ingredients for use in the CK and some items for distribution to the SDFs. The CK utilizes high capacity food processing equipment in preparing entrees and desserts. Finished

products are returned to TISA for storage and eventual distribution in a frozen, chilled or ambient condition, depending upon the nature of the item. The SDFs continue to receive some raw food from local vendors and from TISA in addition to the CFPF products. The CFPF products are reconstituted in the SDFs with conventional DF equipment.

The objective of this evaluation is to determine the economic viability of this CFPF concept over a wide range of operating conditions and facility size. The analysis pertains to new, permanent construction and does not apply to the temporary, prototype facility at Fort Lee.

II. COST ANALYSIS

Method

The procedure selected for this analysis is a parametric economic analysis that utilizes comparative, incremental costs based on the annual cost method.

- o Although other methods of comparative cost analysis (such as present worth, rate of return, and payback period) are well recognized and widely used, the annual cost method is most consistent with Government decision making since it includes total annual operating and capital costs and provides for the changing value of money with time but does not emphasize return on investment.
- o Incremental costs are used since the two alternatives, conventional and CFPF systems, require many common functions. Presenting the cost of these common functions would be both confusing and unnecessary.
- o A parametric analysis is used so that the costs of operations can be obtained over the expected ranges of selected system parameters. The selection is based upon either the degree of uncertainty of the parameter value or the fact that the parameter value is, or can be a policy variable.

In order to examine potential economies of scale, four U.S. Army posts-- Ft. Lee, VA, Ft. Carson, CO, Ft. Lewis, WA, and Ft. Knox, KY--were selected by TSA as potential sites for a CFPF. These four installations were selected in order to obtain: (1) a wide range in feeding strength, (2) FORSCOM and TRADOC representation, and (3) a representative sample of the type and size of DFs at other CONUS installations. Food service provided by the CFPF at these installations would be limited to on post DFs. Two regional facilities are

also considered; both are assumed to be located at Ft. Lee, VA, but differ in the set of satellite bases (SBs) that are served. The two regions are defined as follows (both restricted to SBs within a nominal 200 mile radius of Ft. Lee):

Region I SBs (44,962 meals
per day)

Ft. Lee, VA
Ft. Bragg, NC
Ft. Belvoir, VA
Ft. Myer, VA
Ft. Meade, MD
Vint Hill Farms, VA
Ft. Eustis, VA
Ft. Monroe, VA
Ft. Story, VA

Region II SBs (60,782 meals
per day)

Ft. Lee, VA
Ft. Bragg, NC
Ft. Belvoir, VA
Ft. Myer, VA
Quantico Marine Base, VA
Ft. Eustis, VA
Ft. Monroe, VA
Ft. Story, VA
A set of nine Navy posts, all
located in the greater Norfolk,
VA area.

As is evident from the above definition, the first region is comprised of U.S. Army posts only. The second region deletes two of the smaller army posts and adds a U.S. Marine post and a set of U.S. Navy posts--all are closer to Ft. Lee. The relative magnitude of operations at each facility is illustrated by the CFPF Rations listed in TABLE I. The corresponding number of meals per day (MPD) served in the DFs supplied by a CFPF ranges from about 6250 at Ft. Lee to just under 61,000 for the Region II facility.

The base period for headcounts and food costs at each of the U.S. Army posts is CY1977 with food costs scaled to 1978 prices. The data for the four potential CFPF site locations were obtained through interviews and discussions with food service (and related) personnel and from DA forms 2969 and 4599R. The data on the other Army posts were limited to DA forms. The data for the Marine and Navy posts were provided by Mr. R. Bustead (NARADCOM). The

TABLE I
SUMMARY OF ANNUAL RATIONS, FOOD COST, AND PARTICIPATION

	Data obtained from DA Form 2969 during Base Period						CFPF System Information ²				
	Total Rations (1000 Rations)	Percent Participation	Total Food Cost (\$1000)	Food Cost/Ration	Total Food Cost ¹ (\$1000) Updated	Food Cost/Ration Updated ¹	Total Rations (1000 Rations)	Total Food Cost (\$1000)	Total Food Cost ¹ (\$1000) Updated	Food Cost/Ration	Food Cost/Ration Updated ¹
Ft. Lee	905	64	2558	2.827	2596	2.870	775	2192	2225	2.829	2.871
Ft. Carson	1344	43	3861	2.872	3993	2.971	1337	3839	3971	2.872	2.971
Ft. Lewis	2077	51	6128	2.950	6132	2.952	2023	5966	5970	2.949	2.951
Ft. Knox	3288	76	9579	2.914	9740	2.963	2873	8369	8509	2.913	2.962
Region I	na	na	na	na	na	na	5559	16175	16418	2,909	2.953
Region II	na	na	na	na	na	na	7515	21851	22180	2.908	2.952

¹ Updated to reflect 1978 costs. See Appendix D for details.

² Base number of CFPF rations and food cost were obtained from DA Form 2969 by excluding National Guard and Reserve rations.

conventional system costs are based upon this snapshot taken of the candidate CFPF sites and the potential SBs. Labor costs are based on the GS, Military and Wage Board (by geographical area) schedules included in APPENDIX A.

The operating cost of the CFPF are based on the data collected at the Ft. Lee CFPF (to the extent possible) and extrapolated to the appropriately sized facility. Labor costs are determined per above schedules. Savings in food costs are based upon the base period food costs scaled to 1978 prices; the increase in food costs were based upon the first nine months of 1978 as reflected in DA Form 2969 for Forts Carson, Lewis and Knox--Ft. Lee was excluded since the DFs of interest were obtaining part of their food requirements from the CFPF.

The differences in total annual costs between the conventional system and a CFPF system providing service in the same environments are determined as a function of the system parameters and provide the basis for the comparative cost analysis.

Due to the combinatorial nature of a parametric economic analysis, it is more efficient to partition the food service system into a set of modules that are interrelated in a functional way but are independent of one another with respect to cost. Further, the partitioning into modules is done so that the cost of a given module is a function of a relatively small subset of parameters. The system costs (or the differences between costs of the alternative systems) may then be obtained by summing the costs (or the differences in costs) of the individual modules.

The modules used in this analysis are:

- o Capital
- o CFPF Related Staffing
- o DFs Staffing
- o Food
- o Utilities, Maintenance and Repair

- o Supplies
- o Transportation

Each of these modules is discussed in the next section with respect to: (1) the assumptions made to derive their cost, (2) the parameters that influence their costs, and (3) their impact on the system cost; the latter as a concluding section.

Modules and System Costs

Both the general procedure for determining module costs and the assumptions are addressed in the discussion of the modules given below. A more detailed presentation is given in the appropriate appendix (indicated in parentheses following each section heading); and, the summary tables are, in general, rollups of more detailed tables of an appendix.

A system parameter that we call the CFPF Service Level (CSL) is utilized in defining other system parameters and impacts the cost of all modules. Consequently, it is important that it be clearly understood.

CSL is the fraction of the total dollar value of food issues from a TISA for a set of DFs that is attributed to CFPF products at conventional costs; i.e., if the total dollar value of food issued to a set of DFs for a given period is \$10,000 at conventional costs and the total value of CFPF products issued to those DFs in the same period is \$5000, then $CSL = 0.50$ and $CSL, \% = 50$.

Note that all food issues, including vendor supplied items, for all meals are included in the total dollar value of issues.

CSL can be viewed as a policy variable since it can be set to a certain degree by the managers of the food service system. Consequently, it is one of the parameters that is treated parametrically in the analysis. The levels

selected are 30 and 50%. A level of 30% has been achieved at Ft. Lee during the current CFPF experiments and a level of 50% is nearly an upper limit unless significant changes are made in the master menu. Between 10 and 20% of total issues (maybe even higher for some posts) are vendor supplied and many breakfast and short order items are not produced in the CFPF.

All modules are impacted by the production rate of the CFPF. However, this may not be clear since the production rate is synonymous with Ft. Lee, Ft. Carson, Ft. Lewis, Ft. Knox, Region I, and Region II in ascending order of production levels (from 6250 to 60,782 MPD) and the CSL. Consequently, production is also treated parametrically as a policy variable--at what size base should one construct a CFPF?

Transportation (APPENDICES G & F)

In all but the two regional cases, it is assumed that transportation costs are the same for both the CFPF and the conventional systems. This assumption is made since no change in the current issue/delivery schedule to DFs is anticipated.

The transportation costs for the two regional CFPFs are summarized in TABLE II. The annual cost of this model is a function of the CFPF production (44,962 MPD for Region I and 60,782 MPD for Region II), the CSL, and the delivery routes.

All shipments are made in commercial vehicles at rates based upon information provided by the Military Traffic Management Command, Bayonne, N.J.. All IP products are shipped in refrigerated trailers with deliveries to SBs at least twice per week. Frozen products are shipped in either refrigerated trailers or refrigerated railroad cars, whichever is least costly, and with deliveries as required but at least once per month.

TABLE II
SUMMARY OF ANNUAL TRANSPORTATION COSTS IN THOUSANDS OF DOLLARS

Applicable only for regional CFPFs

<u>Region</u>	<u>MPD</u>	<u>CSL=30%</u>	<u>CSL=50%</u>
I	44,962	289	399
II	60,782	339	486

TABLE III
SUMMARY OF CAPITAL EXPENDITURES AND ANNUAL COSTS IN THOUSANDS OF DOLLARS

<u>CFPF for:</u>	<u>MPD</u>	<u>TOTAL CAPITAL EXPENDITURES</u>		<u>ANNUAL CAPITAL RECOVERY COSTS</u>	
		<u>CSL=30%</u>	<u>CSL=50%</u>	<u>CSL=30%</u>	<u>CSL=50%</u>
Ft. Lee	6,250		6569		912
Ft. Carson	10,841		6654		926
Ft. Lewis	16,362		8611		1167
Ft. Knox	23,384		8691		1180
Region I	44,962	11,026	11,178	1481	1506
Region II	60,782	11,186	11,398	1507	1542

Capital (APPENDIX H)

Since additional freezers for DFs are the only DF modification and the CFPF design is for a self contained complex, the only capital costs are for DF freezers and the CFPF building and equipment. Additional capital costs for TISA freezer space at the SBs are included for the two regional CFPFs. Volumetric requirements for freezers are based on the standard of 62% utilization (per the Military Transportation Rates Manual) and some Ft. Lee experience in space requirements for CFPF production. The CFPF (39' x 25' x 7') freezer was used as a basis for scaling costs for size and inflation.

The CFPF areas and equipment costs were provided by Mr. G. Hudson (TSA, Ft. Lee) and the building costs are scaled for inflation and area from the estimates provided by Wise, Simpson, Aiken Associates for the Ft. Benning CFPF concept design, 1974 per J.K. Prifti (MFR, DRDNA-WS: 6 July and 8 September 1978). The areas, capacities, and corresponding costs are:

AREA Ft ²	MAXIMUM SINGLE-SHIFT CAPACITY, Mls/day	CAPITAL EXPENDITURE (\$1000)	
		BUILDING	EQUIPMENT
40,000	15,000	2,977	3,549
60,000	35,000	4,465	3,943
80,000	70,000	5,953	4,338

Total capital expenditures and annual capital recovery costs (CRC) are summarized in TABLE III. The capital costs are a function of the interest rate, economic life, number of SDFs, and production level in all cases, and of the CSL and SB requirements in the regional cases. Per guidelines from the DOD Economic Analysis Handbook, the interest rate is 10% and the economic life for buildings and equipment are 25 and 10 years respectively. The number of SDFs corresponds to the actual number in use by post.

CFPF Related Staffing (APPENDIX C)

The cost of additional personnel in the peripheral areas of supervision, troop issue, technical support, support division, and training as well as the directly related areas of quality control, microbiological laboratory and the central kitchen are included in this module. Staffing levels for operations at (1) 6600, (2) 15,600, (3) 10,500, and (4) 25-30,000 MPD were provided by Mr. R. Bustead (MFR, DRDNA-0, 15 September 1978) for CSL = 50% and by LTC J. Turner (TSA, Ft. Lee) for CSL = 30% (See APPENDIX C for details). It was assumed that a two shift operation would be used for the two regional CFPFs; the shift configurations are:

Region I: 1st shift staffing from 30,000 meals per day staffing
2nd shift staffing from a modification of the 15,600 meals
per day staffing

Region II: 1st shift staffing per Region I
2nd shift staffing from a modification of the 1st shift
staffing.

The staffing costs and number of people required are summarized in TABLE IV (also includes SDF staffing). Personnel costs in this module and the next are based on the appropriate wage scale (see APPENDIX A) with increases for insurance and all benefits of 18.1% for GS employees and 39% for wage board employees (per CITA guidelines). Second shift premiums are included when appropriate for GS and WB employees (10% for hours between 6 pm and 6 am for GS and 7.5% for WB, per Mrs. J. Brown (TSA, Ft. Lee)).

TABLE IV

SUMMARY OF ANNUAL STAFFING COSTS AND SAVINGS IN THOUSANDS OF DOLLARS

Fort	DF STAFFING						Net Increase (Decrease) in	
	Conventional System		CFPF System		Decrease in			
	Persons	Cost	Persons	Cost	Persons	Cost	Persons	Cost
CSL=30%								
Lee	112	1576	77	1108	35	469	44	709
Carson	248	3366	193	2655	55	711	51	836
Lewis	367	5431	291	4376	76	1055	63	1171
Knox	522	7130	413	5733	109	1397	82	1351
Region I	989	13796	751	10435	238	3361	123	1975
Region II	1238	17362	912	12746	326	4616	136	2179
CSL=50%								
Lee	112	1576	74	1053	38	523	58	918
Carson	248	3366	186	2542	62	824	62	1011
Lewis	367	5431	286	4301	81	1130	74	1387
Knox	522	7130	404	5585	118	1544	104	1675
Region I	989	13796	728	10020	261	3776	150	2393
Region II	1238	17362	872	12056	366	5306	171	2674

DF Staffing (APPENDIX B)

It is assumed that KP requirements are the same for both systems. Also, the central management of the DFs in both systems is assumed to be the same. The only differences in staffing that are captured in this analysis are the number of cooks and DF managers required.

In general there are at least three different staffing levels to consider for a given military DF: (1) the number of people required to run the DF in a strictly garrison feeding environment; (2) the number of authorized personnel for a DF; and (3) the actual number of people assigned to the DF. Insuring that good customer service is provided is the primary consideration in determining the first staffing level. The second staffing level must provide good customer service but it must also consider other requirements peculiar to the DF and the troops that it serves--such as readiness. The third level assumes that the requirements of the second exist but are modified according to the availability of personnel. The latter two levels for Forts Carson, Lewis and Knox for a conventional system were obtained. This information for Fort Lee in a conventional mode was not available--Fort Lee has operated with an IP and DK for several years.

In order to estimate the staffing required for the first level for both the conventional and the CFPF systems, proposed DF staffing tables were developed (see TABLES B.1 & B.2). The need for this information is obvious--if the staffing levels for DFs can be decreased in a CFPF environment, the decrease will be in the level one requirements since the peculiar circumstances for the DF remain. It is anticipated that the number authorized and assigned will decrease by approximately the same amount, but that the

cost of readiness will be essentially unchanged. The savings in staff attributed to a CFPF is determined by comparing the staffing levels and costs obtained via the proposed tables. These savings are summarized in TABLE IV as a function of production level and CSL.

The number of personnel assigned, authorized and proposed (the latter for both the conventional and the CFPF system) and the resulting costs for Forts Carson, Lewis and Knox are summarized in TABLE V. A comparison of the proposed staffing for a conventional system vs the assigned staffing is provided in the last column of the table--this is an estimate of the number of personnel and the corresponding cost that are incurred due to readiness and other circumstances peculiar to the Fort. One could not claim this amount as a potential savings due to the CFPF.

Food (APPENDIX D)

A savings in the cost of food is claimed to be one of the positive attributes of the CFPF concept. However, the authors have not found evidence that this actually occurs; or, if it does, what the actual savings would be. Since the claim is reasonable due to the more efficient food processing techniques of a CFPF and to buying raw food in larger containers, this parameter (food savings) is treated parametrically. As was the case of CSL, a clear definition of food savings is required. As used in this evaluation:

Food savings is the fraction (or per cent) saved of the total dollar value of issues from TISA that would be attributable to CFPF based on conventional food costs; i.e., if the total value of issues for a set of DFs in a given period were \$10,000 for a conventional system and a CFPF system were used to serve these DFs for the same period with a CSL of 50% and a food savings of 15%, then the dollar food savings would be

$$(0.15) \cdot (0.5) \cdot (10,000) = \$750.$$

TABLE V

COMPARISON OF ASSIGNED, AUTHORIZED, AND PROPOSED
SDF PERSONNEL AND COSTS (\$1000)

Fort	Assigned	Authorized	Proposed			Assigned- Proposed Conv.
			Conventional	CFPF 30% CSL	CFPF 50% CSL	
	Number of personnel					
Carson	847	708	248	193	186	599
Lewis	928	776	367	291	286	561
Knox*	686	586	465	375	367	221
	Annual cost of personnel					
Carson	8554	7674	3366	2655	2542	5187
Lewis	9222	8271	5431	4376	4301	3791
Knox*	7760	6823	6312	5189	5053	1447

*The 4 contract DFs are excluded since staffing levels are not available for these facilities.

The values selected for food savings in the parametric analysis are 10, 15 and 20%. If an overall net savings does not accrue in this range, it is highly improbable that any savings are possible in practice.

The food costs used in this analysis are summarized in TABLE I under CFPF Food Cost. Candidate rations for CFPF service are obtained from the total rations by subtracting the number of National Guard and Reserve rations that were served on the base--it is assumed that most or all of these rations would be prepared from scratch by cooks assigned to the guard or reserve unit. Also, only garrison rations are used. The corresponding CFPF production levels by facility are given by these rations. The approximate number of meals corresponding to the given rations is obtained by multiplying rations by a conversion factor that varies by post.

Since an inventory of finished products is introduced to support the CFPF customers, an amount of capital is invested in this inventory that would not exist in the conventional system. Note that the raw food inventories will remain at about the same level. Although the number of days of finished product demand could vary, a 30 day supply (average) is used in this analysis. Due to food savings and CSL, the cost of finished goods in inventory must be as follows:

Annual cost of food = \$AF

Food savings fraction = FS

Annual food savings in dollars = (FS) · (CSL) · (\$AF)

Cost of 30 day supply

of finished product = (1-FS) · (CSL) · (\$AF) · (30) / 365

The cost of carrying inventory is taken as 10% of the value of the inventory on hand--consistent with the interest rate used in determining the CRC.

Food savings, cost of carrying inventory and the net food savings are summarized in TABLE VI as a function of % food savings, CSL and production.

Supplies (APPENDIX E)

Supply costs are limited to the supplies used in the CFPF complex. Based on data collected at Ft. Lee, about 6% of the CFPF (exclusive of laboratory) supply costs (sanitation materials) can be considered to vary with the area of the CFPF and about 94% (primarily packaging materials) varies with the amount of product shipped from the CFPF. Consequently, the latter supply costs are a function of CSL. The supply costs for this evaluation are based on Ft. Lee experience extrapolated to the appropriate facility by area, production and CSL. Laboratory costs are assumed to vary with production as well.

Since Ft. Lee makes extensive use of disposable containers the resulting supply costs are high. Mr R. Bustead supplied approximate costs of alternative packaging methods that result in production related supply costs of about 46% of the costs currently experienced at Ft. Lee if the lowest cost alternative is taken by category.

Supply costs are treated parametrically in this analysis using the extrapolated costs experienced at Ft. Lee as a high estimate and the extrapolated costs based on the lowest cost alternative as a low estimate-- a current lower and upper bound on these costs. The resulting costs are summarized in TABLE VII.

Utilities, Maintenance, and Repair (APPENDIX I)

At the present time all four candidate CFPF sites use a cost distribution factor to allocate utility and M&R costs to functional areas. Since the staffing for the CFPF includes only one person (per shift) to oversee the

TABLE VI
SUMMARY OF ANNUAL FOOD INVENTORY COSTS AND SAVINGS IN THOUSANDS OF DOLLARS

	Food Cost Savings, %					
	10		15		20	
	CSL, %		CSL, %		CSL, %	
	30%	50%	30%	50%	30%	50%
	Food Savings					
Ft. Lee	67	111	100	167	133	222
Ft. Carson	119	199	179	288	238	397
Ft. Lewis	179	299	269	448	358	597
Ft. Knox	255	425	383	638	511	851
Region I	493	821	739	1231	985	1642
Region II	665	1109	998	1663	1331	2218
	Cost of Carrying Inventory					
Ft. Lee	5	8	5	8	4	7
Ft. Carson	9	15	8	14	8	13
Ft. Lewis	13	22	13	21	12	20
Ft. Knox	19	31	18	30	17	28
Region I	36	61	34	57	32	54
Region II	49	82	46	77	44	73
	Net Savings					
Ft. Lee	62	103	95	159	129	215
Ft. Carson	110	184	170	284	230	384
Ft. Lewis	166	276	256	427	346	577
Ft. Knox	236	394	365	608	494	823
Region I	456	760	704	1174	953	1588
Region II	616	1027	952	1586	1287	2145

TABLE VII
SUMMARY OF ANNUAL SUPPLY COSTS IN THOUSANDS OF DOLLARS

CSL, %:		30		50	
Estimate of Supply Costs:		High	Low	High	Low
CFPF for:	MPD				
Ft. Lee	6250	91	47	148	76
Ft. Carson	10,841	154	78	254	128
Ft. Lewis	16,332	233	118	384	193
Ft. Knox	23,384	330	167	546	274
Region I	44,962	631	317	1046	523
Region II	60,782	850	426	1412	704

TABLE VIII
SUMMARY OF ANNUAL UTILITIES AND MAINTENANCE AND REPAIR COSTS
IN THOUSANDS OF DOLLARS

CFPF for:	MPD	CSL=30%	CSL=50%
Ft. Lee	6250	152	190
Ft. Carson	10,841	163	219
Ft. Lewis	16,332	125	147
Ft. Knox	23,384	285	404
Region I	44,962	562	829
Region II	60,782	703	1064

M&R function at Ft. Knox and the two regional facilities--and only for CSL=50%, the continued use of the distribution formula to charge for post engineers is warranted. Also, the energy study of the CFPF is not complete so that meaningful estimates of real utility costs cannot be made. The approach taken herein is to:

- (1) estimate part of the charges for both utilities and M&R by using the cost distribution formula;
- (2) add an energy cost for food processing, freezing and holding food in a freezer--based on a procedure suggested by M. McCormack (MFR,DALO-TAE, 18 July 1978); and,
- (3) add the cost of M&R parts based on the extrapolated cost of parts experienced at Ft. Lee (25 January - 24 September 1978).

The resulting costs are summarized in TABLE VIII as a function of CSL and the production rate.

The Impact of Module Costs on System Cost

A summary of the annual losses (the CFPF system compared to the conventional system) is provided in TABLE IX as a function of the production rate, CSL, food savings, and the high and low estimates for the supply costs. The best situation for all candidate CFPFs occurs at 20% food savings, and low supply cost. However, the best CSL for CFPFs serving only on-site DFs is 30% and for the regional CFPFs is 50%. As you will note, only the largest facility (a CFPF for Region II) indicates a projected savings for:

- (1) high supply cost, 20% food savings and CSL at 30 or 50% (two cases); and,
- (2) low supply cost, all cases except for CSL=50% and 10% food savings (five cases).

TABLE IX
SUMMARY OF ANNUAL LOSSES (SAVINGS) IN THOUSANDS OF DOLLARS*

CSL, Percent	Estimate of Supply Costs	Food Savings, Percent	Ft. Lee MPD=	Ft. Carson MPD=	Ft. Lewis MPD=	Ft. Knox MPD=	Region I MPD=	Region II MPD=
			6250	10,841	16,362	23,384	44,962	60,782
30	High	10	1334	1259	1475	1513	1122	346
		15	1301	1199	1384	1385	873	10
		20	1267	1139	1294	1256	625	(325)
	Low	10	1291	1183	1360	1350	807	(79)
		15	1257	1123	1270	1221	559	(414)
		20	1223	1063	1180	1093	311	(750)
	High	10	1542	1403	1678	1867	1637	846
		15	1486	1303	1528	1652	1223	287
		20	1430	1203	1377	1438	810	(272)
50	Low	10	1470	1277	1487	1594	1114	138
		15	1414	1177	1337	1380	700	(421)
		20	1357	1076	1186	1165	286	(980)

*Detailed summaries of costs and savings by module are included in APPENDIX J, TABLES J. 1 and J.2.

The annual losses (savings) reported in TABLE IX are obtained by summing the module cost for the indicated value of each parameter; i.e., the entry in the fifth row and fourth column requires that the module cost/savings be summed for CSL=30%, food savings=15% and the low estimate of supply cost, for Fort Knox.

Of the parameters for which the parametric analysis was performed, CSL has the greatest impact since it is involved in all module costs and since CFPF production rates are also a function of CSL. Increases in the value of this parameter produce increases in the costs of CFPF staffing, utilities, supplies, capital (regional) and transportation (regional) and increases in food and SDF staffing savings. In all but the regional CFPFs, the increases in costs exceed the increases in savings.

The supply cost estimate has a significant impact on system cost--a decrease from about \$43,000 at the lowest production levels to about \$708,000 at the highest production levels. This is apparent by comparing entries for the same fort at fixed levels of CSL and food savings with the high and low supply costs; and, then fixing the supply cost and letting one of the other parameters vary.

Although not illustrated in Table IX, the imbalance between the increase in CFPF staffing costs and the savings due to decreased SDF staffing is the most obvious impact on system costs (see TABLE IV)--only in the two regional CFPFs does a net saving in staffing costs occur (44,962 MPD for Region I and 60,782 MPD for Region II) for both levels of CSL; a small savings results at Ft. Knox for CSL=30%.

Food savings also has a significant impact on total system costs. However, this is masked in TABLE IX since a change in the CSL level is accompanied by an increase in other costs--the most significant increases are in supplies and utilities.

III. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the previous section, the CFPF concept is not economically viable for a CFPF serving only on-site SDFs. Forty-eight potential operating conditions were evaluated and all resulted in losses in excess of one million dollars per year. Although cost reductions and/or increased savings may be possible, it is highly unlikely that alterations to the system operations would produce cost savings of the magnitude required; e.g., a decrease of approximately 67 people (at an annual expense of \$15,000 per person) would be required to save one million dollars-- an unlikely event. Consequently, we do not recommend proliferation of a CFPF to serve on-site SDFs.

Although a savings is indicated in seven of the twelve cases evaluated for the largest regional CFPF, we do not recommend that it be considered prior to a more careful evaluation. It must be remembered that the regional analysis is basically "rough cut" and is based in part on information that is not supported by documentation.

APPENDIX A

WAGE RATES

A. WAGE RATES

The annual expense charged for each General Schedule (GS) worker is obtained from the base rates of Table A. 1, Step 4, factored up by 18.1% to include benefits.

For Military personnel, the annual expenses for each level are given by Table A.2.

Wage Board (WS, WL, WG) salary scales are different at each base and are outlined in Tables A.3, A.4, A.5, and A.6 for Forts Lee, Carson, Lewis and Knox respectively. In each case Step 3 levels were used. Increasing these rates by 39% to include benefits, and allowing for 2,080 paid hours per year, gives the annual expense for each worker category.

Benefit rates used here are according to CITA guidelines. A summary of the annual expenses per worker by military base is given in table A.7. When a second shift is employed, GS and Wage Board workers receive a shift premium of 10% and 7.5% respectively (the shift differential used at Ft. Lee, provided by Mrs. J. Brown). The shift differential for GS employees applies to only the hours worked between 1800 and 0600: it is assumed that four hours of the second shift are included in this range.

TABLE A.1

EFFECTIVE: 9 OCTOBER 1977

THE GENERAL SCHEDULE

	1	2	3	4	5	6	7	8	9	10
CS 1	\$6,219	\$6,426	\$6,633	\$6,840	\$7,047	\$7,254	\$7,461	\$7,668	\$7,875	\$8,082
CS 2	7,035	7,270	7,505	7,740	7,975	8,210	8,445	8,680	8,915	9,150
CS 3	7,930	8,194	8,458	8,722	8,986	9,250	9,514	9,778	10,042	10,306
CS 4	8,902	9,199	9,496	9,793	10,090	10,387	10,684	10,981	11,278	11,575
CS 5	9,959	10,291	10,623	10,955	11,287	11,619	11,951	12,283	12,615	12,947
CS 6	11,101	11,471	11,841	12,211	12,581	12,951	13,321	13,691	14,061	14,431
CS 7	12,336	12,747	13,158	13,569	13,980	14,391	14,802	15,213	15,624	16,035
CS 8	13,662	14,117	14,572	15,027	15,482	15,937	16,392	16,847	17,302	17,757
CS 9	15,090	15,593	16,096	16,599	17,102	17,605	18,108	18,611	19,114	19,617
CS 10	16,618	17,172	17,726	18,280	18,834	19,388	19,942	20,496	21,050	21,604
CS 11	18,258	18,867	19,476	20,085	20,694	21,303	21,912	22,521	23,130	23,739
CS 12	21,883	22,612	23,341	24,070	24,799	25,528	26,257	26,986	27,715	28,444
CS 13	26,022	26,889	27,756	28,623	29,490	30,357	31,224	32,091	32,958	33,825
CS 14	30,750	31,775	32,800	33,825	34,850	35,875	36,900	37,925	38,950	39,975
CS 15	36,171	37,377	38,583	39,789	40,995	42,201	43,407	44,613	45,819	47,025
CS 16	42,423	43,837	45,251	46,665	48,079 ^a	49,493 ^a	50,907 ^a	52,321 ^a	53,735 ^a	
CS 17	49,696 ^a	51,353 ^a	53,010 ^a	54,667 ^a	56,324 ^a					
CS	58,245 ^a									

^aBasic pay is limited by Section 5308 of Title 5 of the United States Code to the rate for level V of the Executive Schedule which is, as of the effective date of this schedule, \$47,500.

TABLE A.2

C4, QMCENFL Reg 37-22 (9 Dec 77)

RATES FOR USE IN COMPUTING EXPENSES FOR MILITARY PERSONNEL - ARMY

<u>Pay Grade</u>	<u>Annual</u>	<u>Monthly</u>	<u>Daily</u>
O-10	\$54,630	\$4,556	\$211
O-9	50,317	4,193	194
O-8	46,778	3,898	180
O-7	42,051	3,504	162
O-6	38,674	3,223	149
O-5	31,521	2,627	121
O-4	25,988	2,166	100
O-3	21,395	1,783	82
O-2	16,677	1,390	64
O-1	12,231	1,019	47
W-4	25,075	2,089	97
W-3	20,039	1,670	77
W-2	16,638	1,386	64
W-1	14,528	1,211	56
E-9	21,415	1,785	82
E-8	17,777	1,481	68
E-7	15,192	1,266	58
E-6	12,663	1,055	49
E-5	10,673	889	41
E-4	8,958	746	34
E-3	8,192	683	32
E-2	7,557	630	29
E-1	6,561	547	25
Cadets	5,454	454	21

TABLE A.3

DEPARTMENT OF DEFENSE WAGE FIXING AUTHORITY
WASHINGTON, D.C. 20310

AC-1
10 JANUARY 1970

SUBJECT: FEDERAL WAGE SYSTEM REGULAR AND SPECIAL PRODUCTION FACILITATING WAGE RATE SCHEDULES FOR THE WAGE AREA OF RICHMOND, VIRGINIA

TO: COMMANDING OFFICERS OF MILITARY DEPARTMENTS AND FOR COMPONENT INSTALLATIONS IN THE AREA

THE REGULAR AND SPECIAL SCHEDULES SHOWN BELOW HAVE BEEN ESTABLISHED UNDER AUTHORITY OF DOD DIRECT 5120.30, DEPARTMENT OF DEFENSE WAGE FIXING AUTHORITY, 5 JUNE 1968, AND ARE TO BE APPLIED IN ACCORDANCE WITH THE PROVISIONS OF FPM SUPPLEMENT 532-1, 10 INSTALLATIONS LISTED ON THE REVERSE SIDE

WG GRADE	WG-RATES					PL-RATES					WS-WD-WN RATES					WD-PA 5 LEVI
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
1	9.19	9.36	9.53	9.71	9.88	9.61	9.80	9.99	5.10	5.30	6.31	6.57	6.83	7.10	7.36	
2	9.51	9.70	9.89	5.06	5.26	9.96	5.17	5.38	5.50	5.79	6.63	6.91	7.19	7.46	7.74	
3	9.89	5.09	5.29	5.49	5.69	5.32	5.59	5.76	5.98	6.20	6.96	7.25	7.54	7.83	8.12	
4	5.16	5.37	5.58	5.80	6.01	5.67	5.91	6.15	6.39	6.62	7.28	7.58	7.88	8.19	8.49	
5	5.48	5.71	5.94	6.17	6.40	6.93	6.28	6.53	6.78	7.03	7.60	7.92	8.24	8.55	8.87	
6	5.80	6.04	6.28	6.52	6.76	6.37	6.64	6.91	7.17	7.44	7.92	8.25	8.58	8.91	9.24	
7	5.12	5.36	5.60	5.84	6.09	6.74	7.02	7.30	7.58	7.86	8.25	8.59	8.93	9.28	9.62	
8	6.49	6.71	6.96	7.25	7.52	7.83	7.34	7.66	7.97	8.27	8.56	8.92	9.28	9.63	9.99	
9	6.77	7.05	7.33	7.61	7.90	7.45	7.76	8.07	8.38	8.69	8.89	9.26	9.63	10.00	10.37	
10	7.08	7.38	7.68	7.97	8.27	7.80	8.12	8.44	8.77	9.09	9.21	9.59	9.97	10.36	10.74	
11	7.41	7.72	8.03	8.34	8.65	8.15	8.49	8.83	9.17	9.51	9.45	9.85	10.24	10.64	11.03	
12	7.73	8.05	8.37	8.69	9.02	8.51	8.86	9.21	9.57	9.92	9.78	10.19	10.60	11.01	11.41	
13	8.05	8.38	8.73	9.06	9.40	8.86	9.23	9.60	9.97	10.34	10.19	10.61	11.03	11.46	11.90	
14	8.37	8.72	9.07	9.42	9.77	9.21	9.59	9.97	10.36	10.76	10.67	11.11	11.55	12.00	12.44	
15	8.70	9.06	9.42	9.78	10.15	9.57	9.97	10.37	10.77	11.17	11.21	11.68	12.15	12.61	13.08	
IN ACCORDANCE WITH THE PROVISIONS OF FPM SUPPLEMENT																
532-1 DETERMINATION HAS BEEN MADE THAT THERE IS NO																
DOMINANT INDUSTRY IN FEDERAL EMPLOYMENT IN THE WAGE																
AREA. THEREFORE, THERE IS NO APPLICATION OF 5 U.S.C.																
535101 FOR THIS SCHEDULE.																

EFFECTIVE DATE: 15 JANUARY 1970

WILLIAM M. FORREST
CHIEF, TECHNICAL ST.

TABLE A.4

Minimum Salary for GS - 12, 1977
 GS, 12, 1977 - 27 March 1977

GS	MS	VL	WC	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
1				6219.00	6239.00	6259.00	6279.00	6299.00	6319.00	6339.00	6359.00	6379.00	6399.00
2				7035.00	7055.00	7075.00	7095.00	7115.00	7135.00	7155.00	7175.00	7195.00	7215.00
3				7930.00	7950.00	7970.00	7990.00	8010.00	8030.00	8050.00	8070.00	8090.00	8110.00
4				8402.00	8422.00	8442.00	8462.00	8482.00	8502.00	8522.00	8542.00	8562.00	8582.00
5				9959.00	9979.00	9999.00	10019.00	10039.00	10059.00	10079.00	10099.00	10119.00	10139.00
6				10943.20	10963.20	10983.20	11003.20	11023.20	11043.20	11063.20	11083.20	11103.20	11123.20
7				12336.00	12356.00	12376.00	12396.00	12416.00	12436.00	12456.00	12476.00	12496.00	12516.00
8				13662.00	13682.00	13702.00	13722.00	13742.00	13762.00	13782.00	13802.00	13822.00	13842.00
9				15090.00	15110.00	15130.00	15150.00	15170.00	15190.00	15210.00	15230.00	15250.00	15270.00
10				16618.00	16638.00	16658.00	16678.00	16698.00	16718.00	16738.00	16758.00	16778.00	16798.00
11				18258.00	18278.00	18298.00	18318.00	18338.00	18358.00	18378.00	18398.00	18418.00	18438.00
12				19910.00	19930.00	19950.00	19970.00	19990.00	20010.00	20030.00	20050.00	20070.00	20090.00
13				21570.00	21590.00	21610.00	21630.00	21650.00	21670.00	21690.00	21710.00	21730.00	21750.00
14				23240.00	23260.00	23280.00	23300.00	23320.00	23340.00	23360.00	23380.00	23400.00	23420.00
15				24930.00	24950.00	24970.00	24990.00	25010.00	25030.00	25050.00	25070.00	25090.00	25110.00
16				26640.00	26660.00	26680.00	26700.00	26720.00	26740.00	26760.00	26780.00	26800.00	26820.00
17				28370.00	28390.00	28410.00	28430.00	28450.00	28470.00	28490.00	28510.00	28530.00	28550.00
18				30120.00	30140.00	30160.00	30180.00	30200.00	30220.00	30240.00	30260.00	30280.00	30300.00
19				31890.00	31910.00	31930.00	31950.00	31970.00	31990.00	32010.00	32030.00	32050.00	32070.00
20				33680.00	33700.00	33720.00	33740.00	33760.00	33780.00	33800.00	33820.00	33840.00	33860.00
21				35490.00	35510.00	35530.00	35550.00	35570.00	35590.00	35610.00	35630.00	35650.00	35670.00
22				37320.00	37340.00	37360.00	37380.00	37400.00	37420.00	37440.00	37460.00	37480.00	37500.00
23				39170.00	39190.00	39210.00	39230.00	39250.00	39270.00	39290.00	39310.00	39330.00	39350.00
24				41040.00	41060.00	41080.00	41100.00	41120.00	41140.00	41160.00	41180.00	41200.00	41220.00
25				42930.00	42950.00	42970.00	42990.00	43010.00	43030.00	43050.00	43070.00	43090.00	43110.00
26				44840.00	44860.00	44880.00	44900.00	44920.00	44940.00	44960.00	44980.00	45000.00	45020.00
27				46770.00	46790.00	46810.00	46830.00	46850.00	46870.00	46890.00	46910.00	46930.00	46950.00
28				48720.00	48740.00	48760.00	48780.00	48800.00	48820.00	48840.00	48860.00	48880.00	48900.00
29				50690.00	50710.00	50730.00	50750.00	50770.00	50790.00	50810.00	50830.00	50850.00	50870.00
30				52680.00	52700.00	52720.00	52740.00	52760.00	52780.00	52800.00	52820.00	52840.00	52860.00
31				54690.00	54710.00	54730.00	54750.00	54770.00	54790.00	54810.00	54830.00	54850.00	54870.00
32				56720.00	56740.00	56760.00	56780.00	56800.00	56820.00	56840.00	56860.00	56880.00	56900.00
33				58770.00	58790.00	58810.00	58830.00	58850.00	58870.00	58890.00	58910.00	58930.00	58950.00
34				60840.00	60860.00	60880.00	60900.00	60920.00	60940.00	60960.00	60980.00	61000.00	61020.00
35				62930.00	62950.00	62970.00	62990.00	63010.00	63030.00	63050.00	63070.00	63090.00	63110.00
36				65040.00	65060.00	65080.00	65100.00	65120.00	65140.00	65160.00	65180.00	65200.00	65220.00
37				67170.00	67190.00	67210.00	67230.00	67250.00	67270.00	67290.00	67310.00	67330.00	67350.00
38				69320.00	69340.00	69360.00	69380.00	69400.00	69420.00	69440.00	69460.00	69480.00	69500.00
39				71490.00	71510.00	71530.00	71550.00	71570.00	71590.00	71610.00	71630.00	71650.00	71670.00
40				73680.00	73700.00	73720.00	73740.00	73760.00	73780.00	73800.00	73820.00	73840.00	73860.00
41				75890.00	75910.00	75930.00	75950.00	75970.00	75990.00	76010.00	76030.00	76050.00	76070.00
42				78120.00	78140.00	78160.00	78180.00	78200.00	78220.00	78240.00	78260.00	78280.00	78300.00
43				80370.00	80390.00	80410.00	80430.00	80450.00	80470.00	80490.00	80510.00	80530.00	80550.00
44				82640.00	82660.00	82680.00	82700.00	82720.00	82740.00	82760.00	82780.00	82800.00	82820.00
45				84930.00	84950.00	84970.00	84990.00	85010.00	85030.00	85050.00	85070.00	85090.00	85110.00
46				87240.00	87260.00	87280.00	87300.00	87320.00	87340.00	87360.00	87380.00	87400.00	87420.00
47				89570.00	89590.00	89610.00	89630.00	89650.00	89670.00	89690.00	89710.00	89730.00	89750.00
48				91920.00	91940.00	91960.00	91980.00	92000.00	92020.00	92040.00	92060.00	92080.00	92100.00
49				94290.00	94310.00	94330.00	94350.00	94370.00	94390.00	94410.00	94430.00	94450.00	94470.00
50				96680.00	96700.00	96720.00	96740.00	96760.00	96780.00	96800.00	96820.00	96840.00	96860.00
51				99090.00	99110.00	99130.00	99150.00	99170.00	99190.00	99210.00	99230.00	99250.00	99270.00
52				101520.00	101540.00	101560.00	101580.00	101600.00	101620.00	101640.00	101660.00	101680.00	101700.00
53				104070.00	104090.00	104110.00	104130.00	104150.00	104170.00	104190.00	104210.00	104230.00	104250.00
54				106640.00	106660.00	106680.00	106700.00	106720.00	106740.00	106760.00	106780.00	106800.00	106820.00
55				109230.00	109250.00	109270.00	109290.00	109310.00	109330.00	109350.00	109370.00	109390.00	109410.00
56				111840.00	111860.00	111880.00	111900.00	111920.00	111940.00	111960.00	111980.00	112000.00	112020.00
57				114470.00	114490.00	114510.00	114530.00	114550.00	114570.00	114590.00	114610.00	114630.00	114650.00
58				117120.00	117140.00	117160.00	117180.00	117200.00	117220.00	117240.00	117260.00	117280.00	117300.00
59				119790.00	119810.00	119830.00	119850.00	119870.00	119890.00	119910.00	119930.00	119950.00	119970.00
60				122480.00	122500.00	122520.00	122540.00	122560.00	122580.00	122600.00	122620.00	122640.00	122660.00
61				125190.00	125210.00	125230.00	125250.00	125270.00	125290.00	125310.00	125330.00	125350.00	125370.00
62				127920.00	127940.00	127960.00	127980.00	128000.00	128020.00	128040.00	128060.00	128080.00	128100.00
63				130670.00	130690.00	130710.00	130730.00	130750.00	130770.00	130790.00	130810.00	130830.00	130850.00
64				133440.00	133460.00	133480.00	133500.00	133520.00	133540.00	133560.00	133580.00	133600.00	133620.00
65				136230.00	136250.00	136270.00	136290.00	136310.00	136330.00	136350.00	136370.00	136390.00	136410.00
66				139040.00	139060.00	139080.00	139100.00	139120.00	139140.00	139160.00	139180.00	139200.00	139220.00
67				141870.00	141890.00	141910.00	141930.00	141950.00	141970.00	141990.00	142010.00	142030.00	142050.00
68				144720.00	144740.00	144760.00	144780.00	144800.00	144820.00	144840.00	144860.00	144880.00	144900.00
69				147590.00	147610.00	147630.00	147650.00	147670.00	147690.00	147710.00	147730.00	147750.00	147770.00
70				150480.00	150500.00	150520.00	150540.00	150560.00	150580.00	150600.00	150620.00	150640.00	150660.00
71				153390.00	153410.00	153430.00	153450.00	153470.00	153490.00	153510.00	153530.00	153550.00	153570.00
72				156320.00	156340.00	156360.00	156380.00	156400.00	156420.00	156440.00	156460.00	156480.00	156500.00
73				159270.00	159290.00	159310.00	159330.00	159350.00	159370.00	159390.00	159410.00	159430.00	159450.00
74				162240.00	162260.00	162280.00	162300.00	162320.00	162340.00	162360.00	162380.00	162400.00	162420.00
75				165230.00	165250.00	165270.00	165290.00	165310.00	165330.00	165350.00	165370.00	165390.00	165410.00
76				168240.00	168260.00	168280.00	168300.00	168320.00	168340.00	168360.00	168380.00	168400.00	168420.00
77				171270.00	171290.00	171310.00	171330.00	171350.00	171370.00	171390.00	171410.00	171430.00	171450.0

THE WAGE AREA OF SEATTLE-LIVERETT-TACOMA, WASHINGTON

THE REGULAR AND SPECIAL SCHEDULES SHOWN BELOW HAVE BEEN ESTABLISHED UNDER AUTHORITY OF DOD DIRECTIVE 5120.39 "DEPARTMENT OF DEFENSE WAGE FIXING AUTHORITY," 5 JUNE 1968. RATES ARE ESTABLISHED AS REQUIRED BY 5 U.S.C. 5343(D) AND ARE TO BE APPLIED IN ACCORDANCE WITH THE PROVISIONS OF FPM SUPPLEMENT 532-1 TO INSTALLATIONS LISTED ON THE REVERSE SIDE.

[illegible]

EFFECTIVE DATE: 5; NOVEMBER 1977

FORT KNOX

TABLE A.6

WAGE SCHEDULES

WG-WL GRADE	WG RATES					WL-RATES					WS GRADE	WD-MN PAY LEVEL	WS-WD-MN RATES			
	1	2	3	4	5	1	2	3	4	5			1	2	3	4
1	4.67	4.86	5.05	5.25	5.44	5.14	5.35	5.56	5.78	5.99	1		6.71	6.99	7.27	7.55
2	4.91	5.11	5.31	5.52	5.72	5.40	5.62	5.84	6.07	6.29	2		6.95	7.24	7.53	7.82
3	5.15	5.36	5.57	5.79	6.00	5.66	5.90	6.14	6.37	6.61	3	1	7.19	7.49	7.79	8.09
4	5.39	5.61	5.83	6.06	6.28	5.92	6.17	6.42	6.66	6.91	4	2	7.43	7.74	8.05	8.36
5	5.63	5.86	6.09	6.33	6.56	6.19	6.45	6.71	6.97	7.22	5	3	7.67	7.99	8.31	8.63
6	5.86	6.10	6.34	6.59	6.83	6.44	6.71	6.98	7.25	7.52	6	4	7.90	8.23	8.56	8.89
7	6.10	6.35	6.60	6.86	7.11	6.71	6.99	7.27	7.55	7.83	7	5	8.14	8.48	8.82	9.16
8	6.34	6.60	6.86	7.13	7.39	6.97	7.26	7.55	7.84	8.13	8	6	8.38	8.73	9.08	9.43
9	6.58	6.85	7.12	7.40	7.67	7.24	7.54	7.84	8.14	8.44	9	7	8.62	8.98	9.34	9.70
10	6.82	7.10	7.38	7.67	7.95	7.50	7.81	8.12	8.43	8.75	10	8	8.86	9.23	9.60	9.97
11	7.06	7.35	7.64	7.94	8.23	7.77	8.09	8.41	8.74	9.06	11	9	9.08	9.46	9.84	10.22
12	7.29	7.59	7.89	8.20	8.50	8.02	8.35	8.68	9.02	9.35	12	10	9.37	9.76	10.15	10.54
13	7.53	7.84	8.15	8.47	8.78	8.28	8.62	8.96	9.31	9.65	13	11	9.72	10.13	10.54	10.94
14	7.77	8.09	8.41	8.74	9.06	8.54	8.90	9.26	9.61	9.97	14	8	10.15	10.57	10.99	11.42
15	8.01	8.34	8.67	9.01	9.34	8.80	9.17	9.54	9.90	10.27	15	9	10.64	11.08	11.52	11.97
											16		11.18	11.65	12.12	12.58
											17		11.81	12.30	12.79	13.28
											18		12.50	13.02	13.54	14.06
											19		13.26	13.81	14.36	14.91

Effective: 24 April 1977

ANNUAL EXPENSE PER WORKER OF CFPF ADDITIONAL STAFFING

FORT LEE

	GRADE 1	2	3	4	5	6	7	8	9	10	11	12
JOB CLASSIFICATION												
GS	9078	9141	10301	11366	12938	14421	16025	17747	19603	21589	23720	28427
O	12231	16677	21395	25988	31521	38674	42051	46778	50317	54680	0	0
W	14528	16638	20039	25075	0	0	0	0	0	0	0	0
E	6561	7557	8192	8958	10673	12663	15192	17777	21415	0	0	0
WS	19747	20788	21800	22783	23823	24806	25818	26830	27842	28825	29606	30647
WL	14427	15535	16653	17781	18880	19978	21106	22204	23332	24402	25529	26628
WG	13097	14138	15150	16133	17174	18157	19198	20181	21192	22204	23216	24199

FORT CARSON

	GRADE 1	2	3	4	5	6	7	8	9	10	11	12
JOB CLASSIFICATION												
GS	9078	9141	10301	11366	12938	14421	16025	17747	19603	21589	23720	28427
O	12231	16677	21395	25988	31521	38674	42051	46778	50317	54680	0	0
W	14528	16638	20039	25075	0	0	0	0	0	0	0	0
E	6561	7557	8192	8958	10673	12663	15192	17777	21415	0	0	0
WS	21106	21713	22291	22869	23477	24053	24662	25269	25818	26426	27177	28160
WL	16509	17174	17810	18475	19111	19747	20412	21077	21713	22378	23043	23650
WG	15005	15612	16191	16769	17376	17954	18562	19140	19718	20325	20932	21511

FORT LEWIS

	GRADE 1	2	3	4	5	6	7	8	9	10	11	12
JOB CLASSIFICATION												
GS	9078	9141	10301	11366	12938	14421	16025	17747	19603	21589	23720	28427
O	12231	16677	21395	25988	31521	38674	42051	46778	50317	54680	0	0
W	14528	16638	20039	25075	0	0	0	0	0	0	0	0
E	6561	7557	8192	8958	10673	12663	15192	17777	21415	0	0	0
WS	25387	26310	27033	27784	28507	29230	29953	30705	31427	32150	32757	33567
WL	19978	20788	21568	22407	23187	23997	24778	25587	26397	27177	27987	28767
WG	18157	18880	19602	20354	21077	21800	22522	23274	23997	24720	25443	26165

FORT KNOX

	GRADE 1	2	3	4	5	6	7	8	9	10	11	12
JOB CLASSIFICATION												
GS	9078	9141	10301	11366	12938	14421	16025	17747	19603	21589	23720	28427
O	12231	16677	21395	25988	31521	38674	42051	46778	50317	54680	0	0
W	14528	16638	20039	25075	0	0	0	0	0	0	0	0
E	6561	7557	8192	8958	10673	12663	15192	17777	21415	0	0	0
WS	21019	21771	22522	23274	24026	24749	25500	26252	27004	27756	28449	29160
WL	16075	16885	17752	18562	19400	20181	21019	21829	22667	23477	24315	25160
WG	14601	15352	16104	16856	17607	18330	19082	19834	20585	21337	22089	22841

NOTE- ZERO INDICATES 'NOT APPLICABLE'

APPENDIX B

DINING FACILITY STAFFING

The proposed staffing table for conventional DFs is given in Table 8.1. Proposed staffing tables for CFPF DFs at CSLs of 30% and 50% are given in Table 8.2. These tables were reviewed with TSA and NARADCOM personnel. It was agreed that this staffing should be used for comparing the two systems and that KP requirements would remain the same under both systems.

Given the number of rations served per day at a base, rations were allocated to the individual SDFs as follows:

1. At Ft. Lee: Rations were allocated to the SDFs in direct proportion to the capacities of the SDFs.
2. At Fts. Carson, Lewis and Knox: There did not seem to be any correlation between the capacity and the rations served in the DFs. Hence rations were allocated to DFs on the basis of the average rations served per day in the individual DFs in CY77. Rations/day served in individual DFs are summarized in Table 8.3--for Ft. Lewis, the summary gives the rations served per day by account numbers. Since account numbers were associated with specific DFs it was possible to get the rations/day for the DFs. Where more than one DF served an account number, rations were assumed to be equally distributed between them. TABLE 8.3 is based on unofficial worksheets of employees at the bases. Consequently, they will not always agree with DA Form 2969. However, they are sufficiently accurate to determining ration allocation.
3. All other bases: Rations were allocated to the DFs on the basis of summaries provided in DA Form 4599R, 4th Qtr, 1977; e.g., at Ft. Meade, four of the DFs in the range 151-250 rations/day served 347 rations/day. It was assumed that each DF served $347/4 = 87$ rations/day.

Table 8.4 summarizes the total headcount by meal for Fts. Carson, Lewis and Knox using the same data sources used to prepare Table 8.3. It was prepared in order to obtain the ratio to convert rations to meals/day.

and the authorized and assigned staffing for the conventional system were obtained as follows:

1. Ft. Lee: 8 DFs per TSA proposed IDA for DEF.
2. Fts. Carson, Lewis, Knox: the number of DFs open and the authorized and assigned staffing at Fts. Carson, Lewis, Knox correspond to the conditions prevailing at the forts in February, May, March 1978 respectively (the months during which data was collected at these forts).

In the case of Ft. Carson the authorized and assigned staffing for the grades E1-E4 were provided in aggregate. The aggregate authorized E1-E4s were distributed only between E4s and E3s and the aggregate assigned E1-E4s were distributed between E4s, E3s, E2s and E1s using the ratios of E4: E3: E2: E1 observed in FC form 95-1 for the same month.

3. Quantico Marine Base and Naval Bases: information provided by Mr. R. Bustead of NARADCOM.
4. All others: DA form 4599-R; 4th Qtr. 1977

The number of meals served per day is obtained as follows:

1. Ft. Lee: CFPF Man-Days in Table D.1 multiplied by the conversion factor computed from data used in an earlier study [5]. The conversion factor was computed to be 2.9445344.
2. Fts. Carson, Knox, Lewis; CFPF Man-Days in Table D.1 multiplied by the conversion factor obtained from Table B.4.
3. All other bases: The conversion factor is computed as the ratio of the aggregate meals to the aggregate rations served at Fts. Lee, Carson and Lewis. Ft. Knox was excluded due to the large number of people in basic training. For Quantico and the naval bases, the rations served per year derived from Table D.3 were multiplied by the conversion factor. For the remaining bases

the rations served were obtained from Table D.1 and the same conversion factor was used.

Table B.5 provides the summarized 'SDF staff savings' at 30% CSL. This saving results from comparing the proposed staffing for the CFPF system at 30% CSL with the proposed staffing for the conventional system.

Table B.6 provides the summarized 'SDF staff savings' at 50% CSL. This savings results from comparing the proposed staffing for the CFPF system at 50% CSL with the proposed staffing for the conventional system.

There are two tables for Ft. Knox in Tables B.5 and B.6. One corresponds to the meals and number of SDFs which include the contract DFs; the other excludes the contract DFs.

Tables B.7 and B.8 give the staffing costs with the conventional system staffed according to the authorized and assigned staffing respectively.

TABLE B.1

PROPOSED STAFFING FOR CONVENTIONAL DFs

RATIONS	E8	E7	E6	E5	E4	E3	WL8	WG8	WG6	WG5	TOTAL	WL1	WG1	TOTAL PERSONNEL
0-120	0	1	1	2	1	1	1	0	0	1	8	1	5	14
121-145	0	1	1	2	1	1	1	1	0	1	9	1	6	16
146-170	0	1	1	3	1	1	1	1	0	1	10	1	6	17
171-197	0	1	1	3	1	1	1	1	1	1	11	1	8	20
198-223	0	1	1	3	2	1	1	1	1	1	12	1	8	21
224-251	0	1	1	3	2	1	1	1	1	2	13	1	9	23
252-279	0	1	1	3	2	1	1	1	2	2	14	1	10	25
280-307	0	1	1	3	2	2	1	1	2	2	15	1	11	27
308-336	0	1	1	3	2	2	1	2	2	2	16	1	12	29
337-365	0	1	1	3	2	2	1	2	2	3	17	1	13	31
366-395	0	1	1	3	3	2	1	2	2	3	18	1	14	33
396-422	0	1	1	3	3	2	2	2	2	3	19	1	15	35
423-457	0	1	1	3	4	2	2	2	2	3	20	1	16	37
458-49	0	1	1	4	4	2	2	2	2	3	21	1	16	38
49	0	1	1	4	4	2	2	2	3	3	22	1	17	40
521-5	0	1	1	4	4	2	2	3	3	3	23	1	18	42
557-590	0	1	1	4	4	2	2	3	3	4	24	1	19	44
591-624	0	1	1	4	4	2	2	3	4	4	25	1	20	46
625-659	0	1	1	4	5	2	2	3	4	4	26	1	22	49
660-695	1	1	1	4	5	2	2	3	4	4	27	1	23	51
696-731	1	1	1	4	5	2	2	3	4	5	28	1	24	53
732-767	1	1	1	4	5	2	2	3	4	6	29	1	25	55
768-805	1	1	1	4	5	2	2	3	5	6	30	1	26	57
806-843	1	1	1	4	5	2	2	4	5	6	31	1	26	58
844-881	1	1	1	5	5	2	2	4	5	6	32	1	27	60
882-921	1	1	1	5	5	2	2	4	6	6	33	1	29	63

Table B.2

PROPOSED STAFFING FOR CFPF SDFs at 30% CSL
 (Number of WL1, WG1 employees same as in Table B.1)

RATIONS	E8	E7	E6	E5	E4	E3	WL8	WG8	WG6	WG5	TOTAL
0-145	0	1	1	1	1	1	1	0	0	1	7
146-197	0	1	1	1	1	1	1	1	0	1	8
198-251	0	1	1	2	1	1	1	1	0	1	9
252-307	0	1	1	2	1	1	1	1	1	1	10
308-365	0	1	1	2	2	1	1	1	1	1	11
366-422	0	1	1	2	2	1	1	1	1	2	12
423-489	0	1	1	2	2	1	1	1	2	2	13
490-556	0	1	1	2	2	1	1	2	2	2	14
557-624	0	1	1	2	3	1	1	2	2	2	15
625-695	1	1	1	2	3	1	1	2	2	2	16
696-767	1	1	1	2	3	1	1	2	2	3	17
768-843	1	1	1	2	3	1	2	2	2	3	18
844-921	1	1	1	2	3	1	2	2	3	3	19

PROPOSED STAFFING FOR CFPF SDFs at 50% CSL
 (Number of WL1, WG1 employees same as in Table B.1)

RATIONS	E8	E7	E6	E5	E4	E3	WL8	WG8	WG6	WG5	TOTAL
0-157	0	1	1	1	1	1	1	0	0	1	7
158-223	0	1	1	1	1	1	1	1	0	1	8
224-293	0	1	1	2	1	1	1	1	0	1	9
294-365	0	1	1	2	1	1	1	1	1	1	10
366-440	0	1	1	2	2	1	1	1	1	1	11
441-522	0	1	1	2	2	1	1	1	1	2	12
523-607	0	1	1	2	2	1	1	1	2	2	13
608-695	1	1	1	2	2	1	1	1	2	2	14
696-787	1	1	1	2	2	1	1	2	2	2	15
788-881	1	1	1	2	3	1	1	2	2	2	16
882-977	1	1	1	2	3	1	1	2	2	3	17

TABLE B. (1 of 4)

SUMMARY OF HEADCOUNT BY DF

FORT CARSON

D. HALL HC/HEAL RAT/DAY

HEADCOUNT/HEAL

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
3565	69	69	68	50	67	66	75	02	100	85	70	31
0010	44	67	62	40	46	43	44	39	30	32	33	22
12001	55	46	63	64	01	27	0	72	54	64	50	26
1040	233	221	312	239	270	221	233	222	249	245	199	143
1041	163	145	222	176	197	176	08	172	193	179	104	173
1361	218	174	272	244	292	199	240	222	144	180	252	141
1369	169	164	156	193	164	108	92	179	199	255	130	174
1669	275	105	562	337	274	215	201	273	292	332	216	174
1661	120	146	217	170	226	163	02	16	0	51	70	74
011	129	101	143	149	139	110	97	170	119	133	110	135
1012	121	99	110	107	155	128	120	139	08	152	113	119
1210	105	08	116	96	113	101	93	121	120	125	115	95
1219	70	71	54	50	00	60	97	121	51	70	74	56
1117	150	152	159	151	172	147	146	152	117	160	160	131
0452	01	74	111	99	112	42	3	00	95	94	01	70
0823	72	65	73	73	66	74	58	60	84	01	75	77
8054	102	80	00	91	100	112	77	136	06	109	156	97
3265	72	72	93	06	115	79	72	82	54	54	50	20
3275	116	105	144	131	139	113	154	94	81	122	103	03
3465	69	67	01	69	71	113	55	76	63	05	50	32
3474	59	50	70	60	64	60	48	57	55	64	53	53
3165	40	46	47	46	60	40	0	53	46	32	61	49
2061	492	478	401	507	662	559	472	407	265	403	437	384
2161	500	636	526	770	711	516	742	499	511	450	549	455
9612	60	59	77	67	71	67	53	53	47	41	36	04

FORT LEWIS

SUMMARY OF HEADCOUNT BY ACCOUNT NUMBER

ACC. AUT/DAY INC/MEAL RAT/DAY

HEADCOUNT/MEAL

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
101	58	30	0	0	0	0	0	0	0	0	0	0
102	99	92	125	121	130	125	128	160	128	166	171	154
103	249	334	303	276	298	324	269	311	320	305	291	233
105	90	73	91	99	05	88	87	115	91	122	113	106
113	131	113	144	118	120	131	83	133	130	132	138	77
118	163	140	221	153	145	179	140	175	146	144	146	114
120	33	156	223	256	221	83	206	118	0	179	226	244
141	205	170	170	172	165	156	121	139	162	147	185	145
908	103	93	152	153	154	126	115	109	97	103	94	66
914	106	94	113	111	125	139	96	165	111	135	126	143
916	95	98	119	110	131	122	103	183	90	139	133	106
924	117	100	110	134	120	115	77	144	111	132	271	211
926	19	116	115	125	131	126	79	159	29	120	0	0
927	168	192	243	185	240	234	132	121	202	267	256	219
931	81	156	121	77	0	0	0	0	0	0	0	0
932	200	80	162	104	240	264	211	238	69	289	240	220
0	19	34	60	71	0	0	0	0	0	0	0	0
935	128	122	163	222	224	293	215	296	240	39	0	0
936	132	129	97	98	105	81	91	109	90	84	88	62
938	59	54	86	91	85	95	102	108	86	104	93	79
940	112	97	100	0	0	0	0	0	0	141	172	152
943	177	189	184	171	142	173	138	156	29	45	168	132
946	158	149	250	226	158	201	170	258	73	195	218	159
949	168	132	177	170	145	170	158	0	182	189	238	197
950	135	184	193	163	169	170	161	61	146	211	179	146
951	100	97	131	111	101	126	90	219	34	138	166	125
953	151	146	157	147	124	90	154	153	130	162	177	147
954	107	121	136	120	121	150	75	148	140	170	184	112
955	129	100	132	135	157	150	93	162	136	126	132	93
956	341	241	317	242	158	99	233	227	241	270	226	205
958	209	227	229	175	146	168	29	227	185	191	51	223
959	27	260	261	208	183	93	223	191	170	274	322	185
961	156	136	133	89	103	128	72	97	131	104	100	46
964	328	219	322	323	354	301	212	182	28	189	198	177
965	252	242	258	60	169	242	162	189	0	13	171	136
121	0	40	44	19	0	0	0	0	0	0	0	0
509	0	116	136	296	334	317	279	314	0	306	251	196
973	0	0	0	0	90	71	104	0	71	70	0	50
967	0	0	0	0	69	0	84	0	0	0	0	0
968	0	0	0	0	72	0	98	0	0	0	0	0
969	0	0	0	0	77	0	93	0	0	0	0	0
970	0	0	0	0	82	0	58	0	0	0	0	0
971	0	0	0	0	39	0	132	0	0	0	0	0
972	0	0	0	0	36	0	121	0	0	0	0	0
974	0	0	0	0	35	0	62	0	0	0	0	0
975	0	0	0	0	0	0	0	0	17	28	0	0
243	0	0	0	0	0	0	0	0	0	85	17	106

TABLE B. (CONT 3 of 4)

SUMMARY OF HEADCOUNT BY DF

FORT ANOX

D. HALL HC/NEAL RAT/DAY

HEADCOUNT/NEAL

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
6872	91	175	17	91	143	6	119	199	0	0	0	36
6878	119	164	15	16	215	100	139	209	0	127	104	87
6818	131	141	99	195	29	67	213	118	197	76	0	0
6723	113	91	102	37	45	184	81	107	199	88	123	31
6719	121	112	42	184	68	53	218	81	166	100	113	100
6682	120	22	206	84	0	144	101	150	200	26	150	75
6674	118	90	219	44	0	145	102	150	109	20	162	77
6669	111	45	185	84	27	168	67	158	103	0	0	0
6558	109	169	167	167	1	145	35	200	83	86	129	2
6557	111	54	190	129	4	144	18	210	96	0	0	0
6556	105	68	105	120	4	138	14	205	82	101	145	4
6555	103	56	196	120	7	140	29	180	129	49	125	41
6554	54	60	71	41	36	34	108	46	32	56	42	21
6552	124	179	132	117	110	60	0	0	150	169	103	137
6551	117	184	100	200	123	79	0	0	97	217	20	119
6546	116	167	131	112	119	66	0	0	156	168	31	0
6547	99	169	99	121	108	80	0	0	143	81	98	68
6550	122	179	112	199	110	73	0	0	109	193	0	106
6548	127	116	195	0	191	154	66	169	103	167	35	91
6543	124	145	196	0	174	139	49	169	51	193	93	94
6542	125	126	183	0	122	165	69	166	81	172	53	0
6578	116	128	122	123	89	138	69	154	102	142	119	99
6541	120	90	120	37	134	175	118	217	1	202	104	71
6581	90	58	122	71	64	65	101	75	77	0	0	0
6580	116	88	132	108	131	93	72	95	89	144	175	106
7741	34	33	34	29	37	33	33	53	30	36	32	24
298	88	105	109	104	107	96	64	80	73	72	65	57
7394	59	52	54	41	46	57	68	67	59	61	70	49
7308	158	176	96	89	144	175	219	161	161	191	174	97
1019	85	66	83	82	92	95	71	87	76	67	74	47
1475	227	214	252	211	214	234	216	270	266	260	241	124
1307	233	208	237	199	249	261	210	287	233	250	215	188
1479	141	141	151	173	152	147	120	144	133	149	117	80
1480	208	173	220	236	220	238	215	0	221	227	238	111

TABLE B.3 (CONT 4 of 4)

D. HALL HC/HEAL. RAT/DAY	HEADCOUNT/HEAL											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1402	172	178	162	144	195	166	164	122	0	252	0	0
1406	139	143	180	179	137	143	150	186	135	139	106	72
2373	183	194	201	180	231	200	140	139	0	0	0	0
2375	215	221	247	211	239	191	227	223	201	211	210	162
2370	157	162	189	180	196	173	145	149	145	163	157	102
2380	204	211	244	240	271	52	32	221	212	257	280	186
2876	114	115	0	0	0	0	0	0	0	0	0	0
2442	623	631	774	534	774	677	711	713	663	715	687	359
5940	240	250	359	239	213	236	213	218	215	262	190	191
6012	609	609	792	745	582	713	597	597	639	641	489	247
6018	363	363	546	423	381	446	381	425	393	346	245	103
5917	568	569	910	780	580	694	580	424	503	540	479	363
5915	599	596	697	607	632	632	694	655	722	801	469	48
7023	207	205	224	216	159	221	159	221	271	234	153	0
7053	212	209	221	250	162	169	162	179	246	212	132	250
7059	173	177	196	230	89	106	89	192	204	172	133	0
6891	118	118	60	178	188	49	188	49	179	167	111	114
6807	115	114	57	103	64	64	180	47	183	168	116	39
6889	109	109	60	180	77	77	147	9	220	105	109	79
6828	116	116	120	80	25	186	25	12	217	112	102	91
6827	124	123	49	134	66	171	66	122	206	116	33	100
6824	138	138	159	98	175	105	0	105	206	79	134	92
565	118	115	0	0	0	0	0	0	191	45	0	0
1485	141	149	0	0	0	0	0	0	153	156	142	102
2374	143	150	0	0	0	0	0	0	164	131	178	92
2862	14	17	0	0	0	0	0	0	0	9	12	22

TABLE B.4
SUMMARY OF HEADCOUNT BY MEAL

1977	BRKFEST	LUNCH	DINNER	T. MEALS	T. RATIONS
JAN	99978	135148	121827	356953	122785
FEB	90616	116113	102457	309186	103551
MAR	123833	133655	132777	390265	131339
APR	119015	137522	119668	376205	126679
MAY	128143	146900	127126	402169	133238
JUN	106661	118910	103144	328715	110153
JUL	104035	95423	102626	302084	100026
AUG	97287	126253	100202	323742	110039
SEP	97748	104343	91925	294016	96056
OCT	108900	111965	112702	333567	111646
NOV	93029	113000	105826	311855	106136
DEC	78684	94745	88743	262172	89131
TOTALS	1237929	1433977	1309023	3980929	1344779

CARSON

Conversion factor, Rations
to Meals=3980929/1344779=
2.9602849

1977	BRKFEST	LUNCH	DINNER	T. MEALS	T. RATIONS
JAN	129052	162253	142771	434076	147820
FEB	139234	169275	151250	459759	156056
MAR	170730	185247	184491	540468	182041
APR	148681	164414	168321	481416	162830
MAY	155959	182465	185293	523717	178294
JUN	142264	173656	166393	482313	164472
JUL	146573	169905	158776	475254	160786
AUG	152355	165092	166864	484311	163253
SEP	111033	133448	126494	370975	126183
OCT	135301	164973	177218	497492	167936
NOV	158425	177929	174010	510364	172460
DEC	133369	155472	145123	433964	146911
TOTALS	1742976	2004129	1947004	5694109	1929042

LEWIS

Conversion factor, Rations
to Meals= 5694109/1929042=
2.9517807

1977	BRKFEST	LUNCH	DINNER	T. MEALS	T. RATIONS
JAN	285720	324065	311792	921577	311486
FEB	286957	318036	304420	909413	306373
MAR	323858	349920	339544	1013322	340557
APR	265159	293742	272031	829932	275341
MAY	237964	267748	249190	754902	254367
JUN	262122	290880	269487	822489	276571
JUL	265713	291680	274880	832273	279766
AUG	294819	328135	303139	926093	311473
SEP	256675	288133	263554	808362	272009
OCT	250566	282944	259862	793372	267235
NOV	226685	252704	236085	715474	240852
DEC	141150	162443	146258	449851	151710
TOTALS	3097388	3440430	3230242	9768060	3287740

KICK

Conversion factor, Rations
to Meals=9768060/3287740=
2.9710561

TABLE B.5 (1 of 7)

SDF STAFF SAVINGS at 30% CSL

FORT LEE

STAFFING OF DINING FACILITIES FOR 6250 MEALS PER DAY WITH 8 DFS OPEN.
 CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
 CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE OF CATEGORY BEFORE CFF	E8 17777	E7 15192	E6 12663	E5 10673	E4 8958	E3 8192	MLB 22204	W08 20181	W06 18157	W05 17174	E2 7557	E1 6561	TOTAL
1	0	1	1	3	4	2	2	2	2	3	0	0	20
2	0	1	1	3	2	2	1	1	2	2	0	0	15
3	0	1	1	3	2	1	1	1	1	2	0	0	13
4	0	1	1	3	1	1	1	1	1	1	0	0	11
TOTAL PERSONNEL	0	8	8	24	16	11	10	10	11	14	0	0	112
TOTAL COST	0	121536	101304	256152	143320	90112	222040	201810	199727	240436	0	0	1576445

AFTER CFF	1	2	3	4	TOTAL PERSONNEL	TOTAL COST	SAVINGS	
1	0	1	1	1	2	1	1	13
2	0	1	1	2	1	1	1	10
3	0	1	1	2	1	1	1	9
4	0	1	1	1	1	1	1	8
	0	1	1	1	1	1	1	77
TOTAL PERSONNEL	0	8	8	12	10	8	10	0
TOTAL COST	0	121536	101304	128076	89580	45536	177632	0
SAVINGS	0	0	0	128076	53748	24576	44908	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
	0	0	0	0	0			

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFF

CATEGORY 11	P-8400	P-8402
CATEGORY 21	P-3701	
CATEGORY 31	P-3108	
CATEGORY 41	P-3024	P-3110 P-9304 T-2012

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFF

CATEGORY 11	P-8400	P-8402
CATEGORY 21	P-3701	
CATEGORY 31	P-3108	
CATEGORY 41	P-3024	P-3110 P-9304 T-2012

TABLE B.5 (CONT. 2 OF 7)

GRADE CONTROL EXPENSE BY CATEGORY	EB 1/77	E7 15192	E6 12663	E5 10673	E4 8958	E3 8192	MB 21077	MBB 19140	MB5 17954	MB5 17376	E2 7557	E1 6551	TOTAL
1	0	1	1	4	4	2	2	3	3	4	0	0	24
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	2	1	1	1	2	2	0	0	14
4	0	1	1	3	2	1	1	1	1	2	0	0	13
5	0	1	1	3	2	1	1	1	1	1	0	0	12
6	0	1	1	3	1	1	1	1	1	1	0	0	11
7	0	1	1	3	1	1	1	1	0	1	0	0	10
8	0	1	1	2	1	1	1	1	0	1	0	0	9
9	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	24	24	58	33	26	26	14	12	31	0	0	240
TOTAL COST	0	364608	303912	619034	295614	212992	548002	267960	215448	538656	0	0	3158226

[illegible]

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CEPE

[illegible]

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CEPE

CATEGORY	1:	2:	3:	4:	5:	6:
CATEGORY 1:	2181					
CATEGORY 2:	2041					
CATEGORY 3:	1689					
CATEGORY 4:	1016	1361				
CATEGORY 5:	1011	1559	1117			
CATEGORY 6:	911	1012	1551			
	3575	3619				
	3775	1719	3054	6152	3853	4285
					1719	3456
						3517
						1300

AD-A067 929

TROOP SUPPORT AGENCY (ARMY) FORT LEE VA
CENTRAL FOOD PREPARATION SYSTEM.(U)
DEC 78

F/G 6/8

UNCLASSIFIED

NL

2 OF 5
ADA
067929



TABLE B.5 (CONT. 3 OF 7)

UNIT 14118

STAFFING OF DINING FACILITIES FOR 16362 MEALS PER DAY WITH 38 M'S WHEN CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE CITY STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	ED	F7	E6	F5	E4	E3	MLD	WUO	WU6	WU5	E2	E1	TOTAL
ANNUAL EXPENSE OF CATEGORY BEFORE CFF	1777	15192	12663	10673	8958	8192	25587	23274	21000	21077	7557	6561	
1	0	1	1	3	2	2	1	2	2	2	0	0	16
2	0	1	1	3	2	1	1	1	1	2	0	0	13
3	0	1	1	3	2	1	1	1	1	1	0	0	12
4	0	1	1	3	1	1	1	1	1	1	0	0	11
5	0	1	1	3	1	1	1	1	0	1	0	0	10
6	0	1	1	2	1	1	1	1	0	1	0	0	9
7	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	38	38	92	43	40	38	24	12	42	0	0	367
TOTAL COST	0	577296	481194	981916	385194	327680	972306	558576	261600	805234	0	0	5430996

NIER CFF

1	0	1	1	2	2	1	1	1	1	1	0	0	11
2	0	1	1	2	1	1	1	1	0	1	0	0	9
3	0	1	1	1	1	1	1	1	0	1	0	0	8
4	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	0	38	38	43	40	38	38	16	2	38	0	0	291
TOTAL COST	0	577296	481194	458939	350320	311296	972306	372384	43600	800926	0	0	4376261
SAVINGS	0	0	0	522977	26874	16384	0	186192	218000	84308	0	0	1054735

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFF

CATEGORY 11	3420	2006A
CATEGORY 21	3654	3416
CATEGORY 31	2026C	
CATEGORY 41	3421	3157
CATEGORY 51	3417	3114
CATEGORY 61	3281	3222
CATEGORY 71	3475	2020C
	4E1	1270

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFF

CATEGORY 11	3420	2006A
CATEGORY 21	3454	3416
CATEGORY 31	3421	3157
CATEGORY 41	3281	3222
	WE23	9E1

7E1

6101

10

TABLE B.5 (CONT 4 of 7)

STAFFING OF DINING FACILITIES FOR 19829 MEALS PER DAY WITH 49 DFS OPEN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

URANGE ANNUAL EXPENSE OF CATEGORY BEFORE CFF	E0	E7	E6	E5	E4	E3	MLB	WOB	W06	WBS	E2	E1	TOTAL
1	0	1	1	4	4	2	2	3	3	3	0	0	23
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	2	2	1	2	2	2	0	0	16
4	0	1	1	3	2	1	1	1	1	1	0	0	12
5	0	1	1	3	1	1	1	1	1	1	0	0	11
6	0	1	1	3	1	1	1	1	0	1	0	0	10
7	0	1	1	2	1	1	1	1	0	1	0	0	9
8	0	1	1	1	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	49	49	111	60	53	52	19	16	56	0	0	465
TOTAL COST	0	744408	620487	1184703	537480	434176	1135108	376846	293280	985992	0	0	4312480

AFTER CFF

1	0	1	1	2	2	1	1	2	2	2	0	0	14
2	0	1	1	2	2	1	1	1	1	1	0	0	11
3	0	1	1	2	1	1	1	1	0	1	0	0	9
4	0	1	1	1	1	1	1	1	0	1	0	0	8
5	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	0	49	49	54	53	49	49	13	7	52	0	0	375
TOTAL COST	0	744408	620487	576342	474774	401408	1069621	237842	128310	915564	0	0	5188756
SAVINGS	0	0	0	608361	62706	32768	65487	119004	164970	70428	0	0	1123724

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFF

CATEGORY 11	6012												
CATEGORY 21	5915												
CATEGORY 31	6018	5917											
CATEGORY 41	5940												
CATEGORY 51	2375	2380	7053	7023									
CATEGORY 61	7059												
CATEGORY 71	2378	2374	1485	1486									
CATEGORY 81	6824	6818	6548	6542	6543	6552	6827	6550	6719	6541	6882	6878	6578
	6674	6551	6580	6828	6546	6887	6723	6557	6669	6556	6869	6555	6547
	290	6872	1009C	7394	6554	7741	2862						

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFF

CATEGORY 11	6012												
CATEGORY 21	6018												
CATEGORY 31	5940	5915	5917										
CATEGORY 41	2375												
CATEGORY 51	6882	6891	6878	6570	6674	6551	6500	6820	6546	6807	6723	6669	6550
	6869	6554	6555	6547	290	6872	1009C	7394	6554	7741	2862		

TABLE B.5 (CONT 5 of 7)

STAFFING OF DINING FACILITIES FOR 23384 MEALS PER DAY WITH 53 BFFS OPEN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	E0	E7	E6	E5	E4	E3	ML8	M08	M04	M05	E2	E1	TOTAL
ANNUAL EXPENSE	17777	15192	12663	10673	0950	0192	21829	19834	18330	17607	7557	6561	
BEFORE CFF													
1	0	1	1	4	4	2	2	3	3	3	0	0	23
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	2	2	1	2	2	2	0	0	14
4	0	1	1	3	2	1	1	1	1	1	0	0	12
5	0	1	1	3	1	1	1	1	1	1	0	0	11
6	0	1	1	3	1	1	1	1	0	1	0	0	10
7	0	1	1	2	1	1	1	1	0	1	0	0	9
8	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	53	53	123	60	58	57	27	21	42	0	0	522
TOTAL COST	0	805176	671139	1312779	609144	475136	1244253	535518	384930	1091634	0	0	7129709

AFTER CFF

1	0	1	1	2	2	1	1	2	2	2	0	0	14
2	0	1	1	2	2	1	1	1	1	1	0	0	11
3	0	1	1	2	1	1	1	1	0	1	0	0	9
4	0	1	1	1	1	1	1	1	0	1	0	0	8
5	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	0	53	53	60	58	53	53	17	9	57	0	0	413
TOTAL COST	0	805176	671139	640380	519564	434176	1156937	337178	144970	1003599	0	0	5733119
SAVINGS	0	0	0	672399	89580	40960	87316	198340	219960	88035	0	0	1394590

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFF

CATEGORY 11	2442	4012	5915
CATEGORY 21	5917		
CATEGORY 31	4018		
CATEGORY 41	5940	1307C	
CATEGORY 51	2375	2380	7023
CATEGORY 61	7059		
CATEGORY 71	2378	2374	1485
CATEGORY 81	4818	4548	1479
	4551	4590	4532
	4872	1009C	6723
			2862

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFF

CATEGORY 11	2442	4012	5915	5917
CATEGORY 21	4018			
CATEGORY 31	5940	1307C		
CATEGORY 41	2375	2380	7023	
CATEGORY 51	2378	2374	1485	1479
	4541	4682	4891	4578
	4550	6869	6556	4547
				298
				4872
				4551
				4548
				6542
				6543
				4552
				6827
				4723
				2862
				6719
				4669

TABLE B.5, CONT. 6 OF 7)

FORT REGIMENT

STAFFING IN DINING FACILITIES FOR 44764 MEALS PER DAY WITH 95 M'S WFM.
 COMPARISONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
 CFT STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	E8	E7	E6	E5	E4	E3	M.D.	M.H.	M.W.	M.S.	E2	E1	TOTAL
NUMBER	17777	15192	12663	10673	8950	0192	22204	20101	10157	17174	7557	6561	
1	1	1	1	4	5	2	2	3	4	6	0	0	29
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	3	2	2	2	2	3	0	0	19
4	0	1	1	3	2	1	1	1	2	2	0	0	14
5	0	1	1	3	2	1	1	1	1	2	0	0	13
6	0	1	1	3	1	1	1	1	0	1	0	0	10
7	0	1	1	2	1	1	1	1	0	1	0	0	9
8	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	1	95	95	223	125	99	99	84	43	125	0	0	989
TOTAL COST	17777	1443240	1202985	2380079	1119750	811000	2198176	1695204	700751	2146750	0	0	13795740

AFRICAN CFT

GRADE	E8	E7	E6	E5	E4	E3	M.D.	M.H.	M.W.	M.S.	E2	E1	TOTAL
NUMBER	17777	1443240	1202985	1259414	895800	770240	2109380	665973	344983	1717400	0	0	
1	1	1	1	2	3	1	1	2	2	3	0	0	17
2	0	1	1	2	2	1	1	2	2	2	0	0	14
3	0	1	1	2	2	1	1	1	1	2	0	0	12
4	0	1	1	2	1	1	1	1	1	1	0	0	10
5	0	1	1	2	1	1	1	1	0	1	0	0	9
6	0	1	1	1	1	1	1	1	0	1	0	0	8
7	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	1	95	95	118	100	95	95	33	19	100	0	0	751
TOTAL COST	17777	1443240	1202985	1259414	895800	770240	2109380	665973	344983	1717400	0	0	10433192
SAVINGS	0	0	0	1120665	223950	32748	88016	1029231	435768	429350	0	0	3360540

TABLE B.5 (CONT. 7 OF 7)

UNIT NUMBER

STAFFING OF DINING FACILITIES FOR 60782 MEALS PER DAY WITHIN 108 M'S OPEN.
COMPENSATION STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFT STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	E8	E7	E6	E5	E4	E3	MLB	MOU	MO6	MO5	E2	E1	TOTAL
ANNUAL EXPENSE	1777	15192	12663	10673	8958	8192	22204	20181	18157	17174	7557	4561	
IN CATEGORY													
BEFORE CFT													
1	1	1	1	4	5	2	2	3	4	6	0	0	29
2	0	1	1	4	4	2	2	3	4	4	0	0	25
3	0	1	1	4	4	2	2	3	3	3	0	0	23
4	0	1	1	4	4	2	2	2	3	3	0	0	22
5	0	1	1	4	4	2	2	2	2	3	0	0	21
6	0	1	1	3	3	2	2	2	2	3	0	0	20
7	0	1	1	3	3	2	2	2	2	3	0	0	19
8	0	1	1	3	3	2	1	2	2	3	0	0	18
9	0	1	1	3	3	2	1	2	2	3	0	0	17
10	0	1	1	3	2	2	1	2	2	2	0	0	16
11	0	1	1	3	2	2	1	1	2	2	0	0	14
12	0	1	1	3	2	1	1	1	1	2	0	0	13
13	0	1	1	3	1	1	1	1	0	1	0	0	10
14	0	1	1	2	1	1	1	1	0	1	0	0	9
15	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	1	108	108	266	165	124	117	113	73	163	0	0	1238
TOTAL COST	1777	1640736	1367604	2839018	1478070	1015808	2597868	2280453	1325461	2799362	0	0	17362157

AFTER CFT

GRADE	E8	E7	E6	E5	E4	E3	MLB	MOU	MO6	MO5	E2	E1	TOTAL
ANNUAL EXPENSE	1777	15192	12663	10673	8958	8192	22204	20181	18157	17174	7557	4561	
IN CATEGORY													
BEFORE CFT													
1	1	1	1	4	5	2	2	3	4	6	0	0	29
2	0	1	1	4	4	2	2	3	4	4	0	0	25
3	0	1	1	4	4	2	2	3	3	3	0	0	23
4	0	1	1	4	4	2	2	2	3	3	0	0	22
5	0	1	1	4	4	2	2	2	2	3	0	0	21
6	0	1	1	3	3	2	2	2	2	3	0	0	20
7	0	1	1	3	3	2	1	2	2	3	0	0	19
8	0	1	1	3	3	2	1	2	2	3	0	0	18
9	0	1	1	3	3	2	1	2	2	3	0	0	17
10	0	1	1	3	2	2	1	2	2	2	0	0	16
11	0	1	1	3	2	2	1	1	2	2	0	0	14
12	0	1	1	3	2	1	1	1	1	2	0	0	13
13	0	1	1	3	1	1	1	1	0	1	0	0	10
14	0	1	1	2	1	1	1	1	0	1	0	0	9
15	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	1	108	108	266	165	124	117	113	73	163	0	0	1238
TOTAL COST	1777	1640736	1367604	2839018	1478070	1015808	2597868	2280453	1325461	2799362	0	0	17362157
SAVINGS	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE P-1 (1 of 7)
SDF STAFF SCHEDULES AT 50% CSL

1000 111

STAFFING OF DINING FACILITIES FOR 4250 MEALS PER DAY WITH 8 HRS OPEN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

NAME	E8	E7	E6	E5	E4	E3	M.B	M.B	M.B	M.B	E2	E1	TOTAL
ANNUAL EXPENSE	1777	15192	12463	10673	8958	8192	22204	20181	18157	17174	7557	4561	
BEFORE CFF													
1	0	1	1	3	4	2	2	2	2	3	0	0	20
2	0	1	1	3	2	2	1	1	2	2	0	0	15
3	0	1	1	3	2	1	1	1	1	2	0	0	13
4	0	1	1	3	1	1	1	1	1	1	0	0	11
TOTAL PERSONNEL	0	8	8	24	16	11	10	10	11	14	0	0	112
TOTAL COST	0	121536	101304	256152	143328	90112	222040	201810	199727	240436	0	0	1576445

A-51

AFTER CFF													
1	0	1	1	2	2	1	1	1	1	2	0	0	12
2	0	1	1	2	1	1	1	1	0	1	0	0	9
3	0	1	1	1	1	1	1	1	0	1	0	0	8
TOTAL PERSONNEL	0	8	8	12	10	8	8	8	2	10	0	0	74
TOTAL COST	0	121536	101304	128076	89580	45536	177632	161448	36314	171740	0	0	1053166
SAVINGS	0	0	0	128076	53748	24576	44408	40362	163413	48496	0	0	523279

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFF

CATEGORY 11	P-8400	P-8402
CATEGORY 21	P-3701	
CATEGORY 31	P-3100	
CATEGORY 41	P-3024	P-3118 P-9304 1-2012

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFF

CATEGORY 11	P-8400	P-8402
CATEGORY 21	P-3701	P-3108
CATEGORY 31	P-3024	P-3118 P-9304 1-2012

TABLE B.6 (2 of 7)

STAFFING OF DINING FACILITIES FOR 10841 MEALS PER DAY WITH 24 M8 MEN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFT STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

ORGAN ANNUAL EXPENSE BY CATEGORY BEFORE CFT	E8 1777	E7 15192	E6 12663	E5 10673	E4 8958	E3 8192	M8 21077	M8B 19140	M8C 17954	M8D 17376	E2 7557	E1 6561	TOTAL
1	0	1	1	4	4	2	2	3	3	4	0	0	24
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	2	1	1	1	2	2	0	0	14
4	0	1	1	3	2	1	1	1	1	2	0	0	13
5	0	1	1	3	2	1	1	1	1	1	0	0	12
6	0	1	1	3	1	1	1	1	1	1	0	0	11
7	0	1	1	3	1	1	1	1	0	1	0	0	10
8	0	1	1	2	1	1	1	1	0	1	0	0	9
9	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	24	24	58	33	26	26	14	12	31	0	0	240
TOTAL COST	0	364608	303912	419034	295614	212992	548002	267960	215448	538656	0	0	3366226

AFTER CFT

1	0	1	1	2	2	1	1	1	2	2	0	0	13
2	0	1	1	2	2	1	1	1	1	2	0	0	12
3	0	1	1	2	1	1	1	1	0	1	0	0	9
4	0	1	1	1	1	1	1	1	0	1	0	0	8
5	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	0	24	24	28	26	24	24	7	3	26	0	0	186
TOTAL COST	0	364608	303912	298844	232908	196408	505848	133980	53862	451774	0	0	2542346
SAVINGS	0	0	0	320190	62706	16384	42154	133980	161586	84880	0	0	823880

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFT

CATEGORY 1	2161
CATEGORY 2	2061
CATEGORY 3	1669
CATEGORY 4	1010
CATEGORY 5	1361
CATEGORY 6	1041
CATEGORY 7	1117
CATEGORY 8	811
CATEGORY 9	3275

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFT

CATEGORY 1	2161
CATEGORY 2	2061
CATEGORY 3	1369
CATEGORY 4	1041
CATEGORY 5	1117
CATEGORY 6	1200

TABLE B (3 of 7)

STAFFING OF DINING FACILITIES FOR 16362 MEALS PER DAY WITH 38 MFS OPEN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	E8	E7	E6	E5	E4	E3	M8	M08	M16	M05	E2	E1	TOTAL
ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	25587	23274	21800	21077	7557	6561	
BEFORE CFF													
1	0	1	1	3	2	2	1	2	2	2	0	0	16
2	0	1	1	3	2	1	1	1	1	2	0	0	13
3	0	1	1	3	2	1	1	1	1	1	0	0	12
4	0	1	1	3	1	1	1	1	1	1	0	0	11
5	0	1	1	3	1	1	1	1	0	1	0	0	10
6	0	1	1	2	1	1	1	1	0	1	0	0	9
7	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	38	38	92	43	40	38	24	12	42	0	0	367
TOTAL COST	0	577296	481194	981916	385194	327480	972306	558576	261600	885234	0	0	5430996

AFTER CFF

1	0	1	1	2	1	1	1	1	1	1	0	0	10
2	0	1	1	2	1	1	1	1	0	1	0	0	9
3	0	1	1	1	1	1	1	1	0	1	0	0	8
4	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	0	38	38	42	38	38	38	14	2	38	0	0	286
TOTAL COST	0	577296	481194	448266	340404	311294	972306	325836	43600	800926	0	0	4301124
SAVINGS	0	0	0	533650	44790	16384	0	232740	218000	84308	0	0	1129872

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFF

CATEGORY 11	3420	2006A											
CATEGORY 21	3454	3416											
CATEGORY 31	2026C												
CATEGORY 41	3421	3157	1452	3470	3655								
CATEGORY 51	3417	3114	3213	3165	3119	3279							
CATEGORY 61	3281	3222	4438	3218	8627	448							
CATEGORY 71	3475	2020C	2027B	6E23	2015	7E1	6141	5810	8E23	9E1	9657	9834	8B10
	4E1	1270											5E23

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFF

CATEGORY 11	3420	2006A											
CATEGORY 21	3454	3416											
CATEGORY 31	2026C	3421	3157	1452	3470	3655	3417	3114	3213	3165	2027B	6E23	2015
CATEGORY 41	3119	3279	3281	3222	4438	8627	8610	5E23	4E1	3475	2020C	2015	7E1
	6141	5810	8E23	9E1	9657	9834	8B10						

TABLE B.6 (4 of 7)

STAFFING OF DINING FACILITIES FOR 19829 MEALS PER DAY WITH 49 UFS OPEN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33	E34	E35	E36	E37	E38	E39	E40	E41	E42	E43	E44	E45	E46	E47	E48	E49	E50	E51	E52	E53	E54	E55	E56	E57	E58	E59	E60	E61	E62	E63	E64	E65	E66	E67	E68	E69	E70	E71	E72	E73	E74	E75	E76	E77	E78	E79	E80	E81	E82	E83	E84	E85	E86	E87	E88	E89	E90	E91	E92	E93	E94	E95	E96	E97	E98	E99	E100	E101	E102	E103	E104	E105	E106	E107	E108	E109	E110	E111	E112	E113	E114	E115	E116	E117	E118	E119	E120	E121	E122	E123	E124	E125	E126	E127	E128	E129	E130	E131	E132	E133	E134	E135	E136	E137	E138	E139	E140	E141	E142	E143	E144	E145	E146	E147	E148	E149	E150	E151	E152	E153	E154	E155	E156	E157	E158	E159	E160	E161	E162	E163	E164	E165	E166	E167	E168	E169	E170	E171	E172	E173	E174	E175	E176	E177	E178	E179	E180	E181	E182	E183	E184	E185	E186	E187	E188	E189	E190	E191	E192	E193	E194	E195	E196	E197	E198	E199	E200	E201	E202	E203	E204	E205	E206	E207	E208	E209	E210	E211	E212	E213	E214	E215	E216	E217	E218	E219	E220	E221	E222	E223	E224	E225	E226	E227	E228	E229	E230	E231	E232	E233	E234	E235	E236	E237	E238	E239	E240	E241	E242	E243	E244	E245	E246	E247	E248	E249	E250	E251	E252	E253	E254	E255	E256	E257	E258	E259	E260	E261	E262	E263	E264	E265	E266	E267	E268	E269	E270	E271	E272	E273	E274	E275	E276	E277	E278	E279	E280	E281	E282	E283	E284	E285	E286	E287	E288	E289	E290	E291	E292	E293	E294	E295	E296	E297	E298	E299	E300	E301	E302	E303	E304	E305	E306	E307	E308	E309	E310	E311	E312	E313	E314	E315	E316	E317	E318	E319	E320	E321	E322	E323	E324	E325	E326	E327	E328	E329	E330	E331	E332	E333	E334	E335	E336	E337	E338	E339	E340	E341	E342	E343	E344	E345	E346	E347	E348	E349	E350	E351	E352	E353	E354	E355	E356	E357	E358	E359	E360	E361	E362	E363	E364	E365	E366	E367	E368	E369	E370	E371	E372	E373	E374	E375	E376	E377	E378	E379	E380	E381	E382	E383	E384	E385	E386	E387	E388	E389	E390	E391	E392	E393	E394	E395	E396	E397	E398	E399	E400	E401	E402	E403	E404	E405	E406	E407	E408	E409	E410	E411	E412	E413	E414	E415	E416	E417	E418	E419	E420	E421	E422	E423	E424	E425	E426	E427	E428	E429	E430	E431	E432	E433	E434	E435	E436	E437	E438	E439	E440	E441	E442	E443	E444	E445	E446	E447	E448	E449	E450	E451	E452	E453	E454	E455	E456	E457	E458	E459	E460	E461	E462	E463	E464	E465	E466	E467	E468	E469	E470	E471	E472	E473	E474	E475	E476	E477	E478	E479	E480	E481	E482	E483	E484	E485	E486	E487	E488	E489	E490	E491	E492	E493	E494	E495	E496	E497	E498	E499	E500	E501	E502	E503	E504	E505	E506	E507	E508	E509	E510	E511	E512	E513	E514	E515	E516	E517	E518	E519	E520	E521	E522	E523	E524	E525	E526	E527	E528	E529	E530	E531	E532	E533	E534	E535	E536	E537	E538	E539	E540	E541	E542	E543	E544	E545	E546	E547	E548	E549	E550	E551	E552	E553	E554	E555	E556	E557	E558	E559	E560	E561	E562	E563	E564	E565	E566	E567	E568	E569	E570	E571	E572	E573	E574	E575	E576	E577	E578	E579	E580	E581	E582	E583	E584	E585	E586	E587	E588	E589	E590	E591	E592	E593	E594	E595	E596	E597	E598	E599	E600	E601	E602	E603	E604	E605	E606	E607	E608	E609	E610	E611	E612	E613	E614	E615	E616	E617	E618	E619	E620	E621	E622	E623	E624	E625	E626	E627	E628	E629	E630	E631	E632	E633	E634	E635	E636	E637	E638	E639	E640	E641	E642	E643	E644	E645	E646	E647	E648	E649	E650	E651	E652	E653	E654	E655	E656	E657	E658	E659	E660	E661	E662	E663	E664	E665	E666	E667	E668	E669	E670	E671	E672	E673	E674	E675	E676	E677	E678	E679	E680	E681	E682	E683	E684	E685	E686	E687	E688	E689	E690	E691	E692	E693	E694	E695	E696	E697	E698	E699	E700	E701	E702	E703	E704	E705	E706	E707	E708	E709	E710	E711	E712	E713	E714	E715	E716	E717	E718	E719	E720	E721	E722	E723	E724	E725	E726	E727	E728	E729	E730	E731	E732	E733	E734	E735	E736	E737	E738	E739	E740	E741	E742	E743	E744	E745	E746	E747	E748	E749	E750	E751	E752	E753	E754	E755	E756	E757	E758	E759	E760	E761	E762	E763	E764	E765	E766	E767	E768	E769	E770	E771	E772	E773	E774	E775	E776	E777	E778	E779	E780	E781	E782	E783	E784	E785	E786	E787	E788	E789	E790	E791	E792	E793	E794	E795	E796	E797	E798	E799	E800	E801	E802	E803	E804	E805	E806	E807	E808	E809	E810	E811	E812	E813	E814	E815	E816	E817	E818	E819	E820	E821	E822	E823	E824	E825	E826	E827	E828	E829	E830	E831	E832	E833	E834	E835	E836	E837	E838	E839	E840	E841	E842	E843	E844	E845	E846	E847	E848	E849	E850	E851	E852	E853	E854	E855	E856	E857	E858	E859	E860	E861	E862	E863	E864	E865	E866	E867	E868	E869	E870	E871	E872	E873	E874	E875	E876	E877	E878	E879	E880	E881	E882	E883	E884	E885	E886	E887	E888	E889	E890	E891	E892	E893	E894	E895	E896	E897	E898	E899	E900	E901	E902	E903	E904	E905	E906	E907	E908	E909	E910	E911	E912	E913	E914	E915	E916	E917	E918	E919	E920	E921	E922	E923	E924	E925	E926	E927	E928	E929	E930	E931	E932	E933	E934	E935	E936	E937	E938	E939	E940	E941	E942	E943	E944	E945	E946	E947	E948	E949	E950	E951	E952	E953	E954	E955	E956	E957	E958	E959	E960	E961	E962	E963	E964	E965	E966	E967	E968	E969	E970	E971	E972	E973	E974	E975	E976	E977	E978	E979	E980	E981	E982	E983	E984	E985	E986	E987	E988	E989	E990	E991	E992	E993	E994	E995	E996	E997	E998	E999	E1000	E1001	E1002	E1003	E1004	E1005	E1006	E1007	E1008	E1009	E1010	E1011	E1012	E1013	E1014	E1015	E1016	E1017	E1018	E1019	E1020	E1021	E1022	E1023	E1024	E1025	E1026	E1027	E1028	E1029	E1030	E1031	E1032	E1033	E1034	E1035	E1036	E1037	E1038	E1039	E1040	E1041	E1042	E1043	E1044	E1045	E1046	E1047	E1048	E1049	E1050	E1051	E1052	E1053	E1054	E1055	E1056	E1057	E1058	E1059	E1060	E1061	E1062	E1063	E1064	E1065	E1066	E1067	E1068	E1069	E1070	E1071	E1072	E1073	E1074	E1075	E1076	E1077	E1078	E1079	E1080	E1081	E1082	E1083	E1084	E1085	E1086	E1087	E1088	E1089	E1090	E1091	E1092	E1093	E1094	E1095	E1096	E1097	E1098	E1099	E1100	E1101	E1102	E1103	E1104	E1105	E1106	E1107	E1108	E1109	E1110	E1111	E1112	E1113	E1114	E1115	E1116	E1117	E1118	E1119	E1120	E1121	E1122	E1123	E1124	E1125	E1126	E1127	E1128	E1129	E1130	E1131	E1132	E1133	E1134	E1135	E1136	E1137	E1138	E1139	E1140	E1141	E1142	E1143	E1144	E1145	E1146	E1147	E1148	E1149	E1150	E1151	E1152	E1153	E1154	E1155	E1156	E1157	E1158	E1159	E1160	E1161	E1162	E1163	E1164	E1165	E1166	E1167	E1168	E1169	E1170	E1171	E1172	E1173	E1174	E1175	E1176	E1177	E1178	E1179	E1180	E1181	E1182	E1183	E1184	E1185	E1186	E1187	E1188	E1189	E1190	E1191	E1192	E1193	E1194	E1195	E1196	E1197	E1198	E1199	E1200	E1201	E1202	E1203	E1204	E1205	E1206	E1207	E1208	E1209	E1210	E1211	E1212	E1213	E1214	E1215	E1216	E1217	E1218	E1219	E1220	E1221	E1222	E1223	E1224	E1225	E1226	E1227	E1228	E1229	E1230	E1231	E1232	E1233	E1234	E1235	E1236	E1237	E1238	E1239	E1240	E1241	E1242	E1243	E1244	E1245	E1246	E1247	E1248	E1249	E1250	E1251	E1252	E1253	E1254	E1255	E1256	E1257	E1258	E1259	E1260	E1261	E1262	E1263	E1264	E1265	E1266	E1267	E1268	E1269	E1270	E1271	E1272	E1273	E1274	E1275	E1276	E1277	E1278	E1279	E1280	E1281	E1282	E1283	E1284	E1285	E1286	E1287	E1288	E1289	E1290	E1291	E1292	E1293	E1294	E1295	E1296	E1297	E1298	E1299	E1300	E1301	E1302	E1303	E1304	E1305	E1306	E1307	E1308	E1309	E1310	E1311	E1312	E1313	E1314	E1315	E1316	E1317	E1318	E1319	E1320	E1321	E1322	E1323	E1324	E1325	E1326	E1327	E1328	E1329	E1330	E1331	E1332	E1333	E1334	E1335	E1336	E1337	E1338	E1339	E1340	E1341	E1342	E1343	E1344	E1345	E1346	E1347	E1348	E1349	E1350	E1351	E1352	E1353	E1354	E1355	E1356	E1357	E1358	E1359	E1360	E1361	E1362	E1363	E1364	E1365	E1366	E1367	E1368	E1369	E1370	E1371	E1372	E1373	E1374	E1375	E1376	E1377	E1378	E1379	E1380	E1381	E1382	E1383	E1384	E1385	E1386	E1387	E1388	E1389	E1390	E1391	E1392	E1393	E1394	E1395	E1396	E1397	E1398	E1399	E1400	E1401	E1402	E1403	E1404	E1405	E1406	E1407	E1408	E1409	E1410	E1411	E1412	E1413	E1414	E1415	E1416	E1417	E1418	E1419	E1420	E1421	E1422	E1423	E1424	E1425	E1426	E1427	E1428	E1429	E1430	E1431	E1432	E1433	E1434	E1435	E1436	E1437	E1438	E1439	E1440	E1441	E1442	E1443	E1444	E1445	E1446	E1447	E1448	E1449	E1450	E1451	E1452	E1453	E1454	E1455	E1456	E1457	E1458	E1459	E1460	E1461	E1462	E1463	E1464	E1465	E1466	E1467	E1468	E1469	E1470	E1471	E1472	E
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STAFFING OF DINING FACILITIES FOR 23384 MEALS PER DAY WITH 5.0% OFFER.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CITY STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

UNAME	EB	E7	E6	E5	E4	E3	MLB	WUB	WGB	WOS	E2	E1	TOTAL
OF CATEGORY	1777	13192	12663	10673	8950	8192	21029	19834	18330	17607	7557	6561	
1	0	1	1	4	4	2	2	3	3	3	0	0	23
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	2	2	1	2	2	2	0	0	16
4	0	1	1	3	2	1	1	1	1	1	0	0	12
5	0	1	1	3	1	1	1	1	1	1	0	0	11
6	0	1	1	3	1	1	1	1	0	1	0	0	10
7	0	1	1	2	1	1	1	1	0	1	0	0	9
8	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	0	53	53	123	68	58	57	27	21	42	0	0	522
TOTAL COST	0	805174	471139	1312779	409144	475136	1244253	535518	384930	1091634	0	0	7129709

AFTER CFPF

1	0	1	1	2	2	1	1	1	2	2	0	0	13
2	0	1	1	2	2	1	1	1	1	2	0	0	12
3	0	1	1	2	1	1	1	1	1	1	0	0	10
4	0	1	1	1	1	1	1	1	0	1	0	0	8
5	0	1	1	1	1	1	1	0	0	1	0	0	7
TOTAL PERSONNEL	0	53	53	58	57	53	53	12	8	57	0	0	404
TOTAL COST	0	805174	471139	619034	510606	434176	1156937	238008	146640	1003599	0	0	5585315
SAVINGS	0	0	0	693745	98538	40960	87316	297510	238290	88035	0	0	1544394

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY BEFORE CFPF

CATEGORY 11	2442	6012	5915										
CATEGORY 21	5917												
CATEGORY 31	6018												
CATEGORY 41	5940	1507C											
CATEGORY 51	2375	2380	1480	7053	7023								
CATEGORY 61	7059												
CATEGORY 71	2378	2374	1485	1486	1479	4824							
CATEGORY 81	6818	6548	6542	6543	6552	6827	6550	6719	6541	6682	6891	6578	6674
	4551	4580	4828	6546	6807	6723	6557	6669	6550	6869	6556	6547	298
	6872	1007C	7394	6554	7741	2062							

DINING FACILITIES CORRESPONDING TO DINING FACILITY CATEGORY AFTER CFPF

CATEGORY 11	2442	6012	5915										
CATEGORY 21	5917												
CATEGORY 31	6018												
CATEGORY 41	5940	1507C	2375	2380	1480	7053	7023	6818	6548	6542	6546	6547	6550
CATEGORY 51	7059	2378	2374	1485	1486	1479	4824	6551	6580	6820	6546	6723	6557
	6719	6541	6682	6891	6870	6570	6674	6551	6580	6820	6546	6723	6557
	6669	6550	6869	6556	6555	6547	298	6872	10090	7394	6554	7741	2062

TABLE B.6 (6 of 7)

FORT REGIMENT

STAFFING IN DINING FACILITIES FOR 44962 MEALS PER DAY WITH 95 M'S IN-1N.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE ANNUAL EXPENSE OF CATEGORY BEFORE CFF	EB 17777	E7 15192	E6 12663	E5 10673	E4 8958	E3 8192	MB 22204	MOB 20181	MB6 18157	MB5 17174	E2 7557	E1 6561	TOTAL
1	1	1	1	4	5	2	2	3	4	6	0	0	29
2	0	1	1	4	4	2	2	2	3	3	0	0	22
3	0	1	1	3	3	2	2	2	2	3	0	0	19
4	0	1	1	3	2	1	1	1	2	2	0	0	14
5	0	1	1	3	2	1	1	1	1	2	0	0	13
6	0	1	1	3	1	1	1	1	0	1	0	0	10
7	0	1	1	2	1	1	1	1	0	1	0	0	9
8	0	1	1	2	1	1	1	0	0	1	0	0	8
TOTAL PERSONNEL	1	95	95	223	125	99	99	84	43	125	0	0	989
TOTAL COST	17777	1443240	1202985	2380079	1119750	811008	2198196	1695204	780751	2146750	0	0	13795740

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AFTER CFF

1	2	3	4	5	6	TOTAL PERSONNEL	TOTAL COST	SAVINGS
1	0	0	0	0	0	1	17777	0
2	1	1	1	2	2	1	1443240	0
3	1	1	1	2	2	1	1202985	0
4	1	1	1	2	1	1	2380079	0
5	1	1	1	1	1	1	1119750	0
6	1	1	1	1	1	1	811008	0
TOTAL PERSONNEL	1	95	95	118	99	28	17777	0
TOTAL COST	17777	1443240	1202985	1359414	884042	565068	17777	0
SAVINGS	0	0	0	1120665	232908	1130136	17777	0

TABLE B (7 of 7)

FOOTNOTES

STAFFING OF DINING FACILITIES FOR 60782 MEALS PER DAY WITHIN OFS WREN.
CONVENTIONAL STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE
CFF STAFFING ACCORDING TO THE PROPOSED STAFFING TABLE

GRADE	E8	E7	E6	E5	E4	E3	MLO	M08	M05	E2	E1	TOTAL
ANNUAL EXPENSE	17777	15192	12663	10674	0958	8192	22204	20181	18157	17174	7557	6561
BEFORE CFF	1	1	1	4	5	2	2	3	4	6	0	39
1	0	1	1	4	4	2	2	3	4	4	0	25
2	0	1	1	4	4	2	2	3	3	3	0	23
3	0	1	1	4	4	2	2	2	3	3	0	22
4	0	1	1	4	4	2	2	2	3	3	0	21
5	0	1	1	3	4	2	2	2	2	3	0	20
6	0	1	1	3	4	2	2	2	2	3	0	19
7	0	1	1	3	3	2	2	2	2	3	0	18
8	0	1	1	3	3	2	2	2	2	3	0	17
9	0	1	1	3	2	2	2	2	2	2	0	16
10	0	1	1	3	2	2	2	2	2	2	0	14
11	0	1	1	3	2	2	2	2	2	2	0	13
12	0	1	1	3	2	2	2	2	2	2	0	10
13	0	1	1	3	2	2	2	2	2	2	0	9
14	0	1	1	3	2	2	2	2	2	2	0	8
15	0	1	1	2	2	2	2	2	2	2	0	1238
TOTAL PERSONNEL	1	108	108	266	165	124	117	113	73	163	0	17362157
TOTAL COST	17777	1640736	1367604	2039018	1478070	1015808	2597868	2280453	1325461	2799362	0	0

AFTER CFF	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL PERSONNEL	1	108	108	143	122	108	108	40	20	114	0	0	872	0	12056216
TOTAL COST	17777	1640736	1367604	1526239	1092876	884736	2398032	807240	363140	1957836	0	0	5305941	0	0
SAVINGS	0	0	0	1312779	385194	131072	199016	1473213	962321	841526	0	0	0	0	0

TABLE B.7
STAFFING COSTS FOR AUTHORIZED STAFFING

LINE NUMBER

STAFFING OF DINING FACILITIES FOR 10841 MEALS PER DAY WITH 24 MFS OPEN.

	E0	E7	E6	E5	E4	E3	M00	M06	M05	E2	E1	TOTAL
GRAND ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	19140	17954	17376	7537	6561	
BEFORE CFF	0	102	123	200	149	134	0	0	0	0	0	708
TOTAL PERSONNEL	0	1549584	1557549	2134600	1334742	1097720	0	0	0	0	0	7674203

LINE NUMBER

STAFFING OF DINING FACILITIES FOR 16362 MEALS PER DAY WITH 38 MFS OPEN.

	E0	E7	E6	E5	E4	E3	M08	M06	M05	E2	E1	TOTAL
GRAND ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	23274	21000	21077	7357	6561	
BEFORE CFF	1	104	118	184	257	107	0	0	0	4	1	776
TOTAL PERSONNEL	17777	1579968	1494234	1963832	2302206	876544	0	0	0	30220	6561	8271350

FURT KNOX

STAFFING OF DINING FACILITIES FOR 19829 MEALS PER DAY WITH 49 MFS OPEN.

	E0	E7	E6	E5	E4	E3	M08	M06	M05	E2	E1	TOTAL
GRAND ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	21829	19834	18330	7557	6561	
BEFORE CFF	0	73	80	101	157	102	21	35	0	4	1	506
TOTAL PERSONNEL	0	1109016	1013040	1077973	1405406	135584	450409	494190	0	45342	6561	822591

TABLE B.8
STAFFING COSTS FOR SIGNED STAFFING

FORT CARSON

STAFFING OF DINING FACILITIES FOR 10041 MEALS PER DAY WITH 29 MFB OPEN.

	EO	E7	E6	E5	E4	E3	MA	MM	MO	MO	MO	E2	E1	TOTAL
UNRAID ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	21077	21077	19140	17934	17376	7537	6561	
BEFORE CFF														
TOTAL PERSONNEL	1	69	126	189	200	100	0	0	0	0	0	71	11	817
TOTAL COST	17777	1040248	1595539	2017197	1791600	1474560	0	0	0	0	0	536547	72171	8553630

FORT LEWIS

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STAFFING OF DINING FACILITIES FOR 14362 MEALS PER DAY WITH 30 MFB OPEN.

	EO	E7	E6	E5	E4	E3	MA	MM	MO	MO	MO	E2	E1	TOTAL
UNRAID ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	23307	21077	21000	21077	21077	7537	6561	
BEFORE CFF														
TOTAL PERSONNEL	6	81	116	171	203	210	0	0	0	0	0	123	16	920
TOTAL COST	106662	1230532	1468908	1825083	1836390	1720320	0	0	0	0	0	929511	104776	9222402

FORT KNOX

STAFFING OF DINING FACILITIES FOR 19827 MEALS PER DAY WITH 49 MFB OPEN.

	EO	E7	E6	E5	E4	E3	MA	MM	MO	MO	MO	E2	E1	TOTAL
UNRAID ANNUAL EXPENSE	17777	15192	12663	10673	8958	8192	21829	19834	19834	18330	17607	7557	6561	
BEFORE CFF														
TOTAL PERSONNEL	3	72	75	156	183	69	21	35	35	0	10	58	4	684
TOTAL COST	53331	1093824	949725	1644988	1639314	565248	458409	494190	494190	0	176070	438306	26244	7759649

APPENDIX C

CFPF ADDITIONAL STAFFING REQUIREMENTS

C. CFPF ADDITIONAL STAFFING REQUIREMENTS

The CFPF concept mandates increases in staffing, not only in the central cooking and preparation areas, but in supervisory, troop issue, support, and training branches as well. Two staffing levels are provided; the first assumes a 50% CSL, the second a CSL of 30%. These increased requirements and their associated costs are presented in various tables as described below.

CSL=50%

Staffing for Forts Lee, Carson, Lewis and Knox, (Tables C.1, C.2, C.3, and C.4 respectively) were provided by DRDNA-0, MFR, trip report of R. Bustead, dated 15 September 1978, which is included as Table C.5.

The staffing for the regional analysis was estimated from the staffing levels provided for the two larger facilities (15,600 meals per day and 25-30,000 meals per day). A two shift operation was assumed for each region:

Region I (Approximately 45,000 meals per day)

1st Shift, identical to the staffing for 25-30,000 meals per day

2nd Shift, a modification of the staffing for 15,600 meals per day

Region II (Approximately 60,000 meals per day)

1st Shift, same as Region I

2nd Shift, a modification of the 1st shift.

The modifications to the shifts are described below with reference to Table C.5 by paragraph; three possible descriptions occur: (1) none of the personnel work on the second shift; (2) all of the personnel work on the 2nd shift; or (3) the particular personnel who work on the 2nd shift are listed.

<u>Par/Descr.</u>	<u>Job</u>	<u>Grade</u>	<u>Personnel on 2nd Shift</u>	
			<u>Region I</u>	<u>Region II</u>
01 Dir Ofc			none	none
02 Tech Spt			none	none
02A QC/MICRO	Fd Insp Sp	E6	1	1
	Fd Insp Sp	E5	1	1
	Bio Lab Tech	GS5	1	1

02B Int San			none	none
03 Spt Div	Supply Clk	GS5	1	1
	Fd. Eq. Mech	WG10	1	1
03B Trng			none	none
03A Trp lss			none	none
05 Can Prep			none	none
05A Fd Prep	Fd. Supv.	E8	1	1
05B Scaling			all	all
05C Veg/Sld			all	all
05D Dessert			all	all
05E Main Kit			all	all
05F Pkg			all	all
05G Equip Wash			all	all
05H Storage			all	all

The resulting staffing and corresponding costs for the regional CFPFs, at 50% CSL, are summarized in Tables C.6 to C.9.

CSL=30%

A modification of DRDNA-0, MFR, trip report of R. Bustead, 15 September 1978, was provided by Lt. Col. J. Turner. This details staffing levels for Forts Lee, Carson, Lewis and Knox, (Tables C.10, C.11, C.12, and C.13 respectively) at a CSL of 30%, and is included as Table C.14.

The staffing for the regional analysis at CSL=30%, was determined using the same procedure as outlined above for the regional analysis with a CSL of 50%. In the same way, a two shift operation was assumed for each region, and staffing levels (at CSL=30%) for the two larger facilities were used. Here, the table outlining second shift modifications apply to Table C.14, and is identical to that used above with the following two exceptions:

- 1) In 03 Support Division--the Food Equipment Mechanic (WG10) is eliminated.
- 2) In 05G Equipment Wash--staffing identical to that at CSL=50% is used.

The resulting staffing and corresponding costs for the regional CFPFs, at 30% CSL, are summarized in Tables C.15 to C.18.

At the time that the above regional staffing was developed, all available information was for CFPF operations at no more than 30,000 meals per day. Also, staffing guidelines for a single shift operation above 30,000 meals per day have not been provided as of the current time. The above staffing for a two shift operation has been reviewed with NARADCOM personnel (Mr. R. Bustead and Dr. G. Hertweck) and approved verbally for use in this "rough cut" regional analysis.

TABLE C.1

SUMMARY OF CFFP ADDITIONAL STAFFING
FORT LEE- 6250 MEALS/DAY

JOB CLASSIFICATION	GRADE												TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
OS	0	0	0	0	4	0	2	0	0	0	2	2	10
O	0	0	1	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	2	2	4	3	1	1	0	0	0	0	13
US	0	0	0	0	0	0	0	0	0	0	0	0	0
UL	0	3	0	0	0	0	0	2	0	0	0	0	5
UB	0	14	2	2	4	0	0	4	0	0	0	0	20
													50

COST OF CFFP ADDITIONAL STAFFING
FORT LEE- 6250 MEALS/DAY

JOB CLASSIFICATION	GRADE												SUBTOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
OS	0	0	0	0	51752	0	32050	0	0	0	47440	54834	188096
O	0	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	16384	17916	42692	37989	15192	17777	0	0	0	0	147950
US	0	0	0	0	0	0	0	0	0	0	0	0	0
UL	0	46465	0	0	0	0	0	44408	0	0	0	0	91073
UB	0	197932	30300	32266	103044	0	0	80724	0	0	0	0	444266
									COST OF GRADE DIFFERENTIAL(S)				0
									TOTAL				918768
									SAVINGS DUE TO USE OF PPT WORKER(S)				429
									TOTAL INCLUDING PPT SAVINGS				918

TOTAL
SAVINGS DUE TO USE OF PPT WORKER(S)
TOTAL INCLUDING PPT SAVINGS

TABLE 2

SUMMARY OF CFFP ADDITIONAL STAFFING
FORT CARSON- 10841 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GB	0	0	1	4	0	2	0	0	0	2	2	11
0	0	0	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	2	4	3	1	3	0	0	0	0	15
WB	0	0	0	0	0	0	0	0	0	0	0	0
WL	0	0	0	0	0	0	2	0	0	0	0	5
WJ	0	2	2	7	0	0	4	0	0	0	0	29
												TOTAL 62

COST OF CFFP ADDITIONAL STAFFING
FORT CARSON- 10841 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GB	0	0	11564	51752	0	32050	0	0	0	47440	54854	199662
0	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	16384	17914	42692	37989	18192	53331	0	0	0	0	183504
WB	0	0	0	0	0	0	0	0	0	0	0	0
WL	0	51522	0	0	0	0	42154	0	0	0	0	93674
WJ	0	218568	33538	121632	0	0	76560	0	0	0	0	482680
												COST OF GRADE DIFFERENTIAL(S) 4707
												TOTAL 1011612
												SAVINGS DUE TO USE OF PFT WORKER(S) 434
												TOTAL INCLUDING PFT SAVINGS 1011178

TABLE C.3

SUMMARY OF CFPF ADDITIONAL STAFFING
FORT LEWIS- 16362 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GS	0	0	0	4	0	3	0	1	0	2	2	13
GR	0	1	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	1	0	1	1	4	0	0	0	0	15
WS	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	0	0	1	0	0	1	0	0	0	0	4
WG	0	3	0	9	2	0	4	0	0	0	0	37
	19											
TOTAL												74

COST OF CFPF ADDITIONAL STAFFING
FORT LEWIS- 16362 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GS	0	0	0	51752	0	48075	0	19603	0	47440	56854	235290
GR	0	21395	11564	0	0	0	0	0	0	0	0	47383
W	0	0	25788	0	0	0	0	0	0	0	0	0
E	0	0	0	0	12663	15192	71108	0	0	0	0	193305
WS	0	0	0	0	0	0	30705	0	0	0	0	30705
WL	0	0	0	23187	0	0	25587	0	0	0	0	431926
WG	0	58806	0	189693	43600	0	93096	0	0	0	0	743915
	358720											4707
COST OF GRADE DIFFERENTIAL (B)												
TOTAL												1367231

Table C.4

CSM-502

SUMMARY OF CFFP ADDITIONAL STAFFING
FORT KNOX- 23384 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
OS	0	0	2	4	0	3	0	1	0	2	3	15
O	0	1	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	9	10	1	1	7	1	0	0	0	29
WS	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	0	0	2	0	0	1	0	0	0	0	7
WG	0	4	0	11	2	0	4	0	1	0	0	50
	26	4	2									
TOTAL												104

COST OF CFFP ADDITIONAL STAFFING
FORT KNOX- 23384 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
OS	0	0	23132	51752	0	48075	0	19603	0	47440	85281	275283
O	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	80622	106730	12663	15192	124439	21415	0	0	0	361061
WS	0	0	0	0	0	0	26252	0	0	0	0	26252
WL	0	0	0	38800	0	0	21829	0	0	0	0	128169
WG	0	67540	33712	193677	36660	0	79336	0	21337	0	0	828290
	399152	64416										8824
COST OF GRADE DIFFERENTIAL (8)												
TOTAL												1675262

DRINA-0

15 September 1978

MEMORANDUM FOR RECORD:

SUBJECT: Trip Report - Mr. Ronald L. Bustead T.O. #8-157 dtd 25 August 1978 to Ft. Lee, VA on 30 August through 1 September 1978.
(USA 8-2)

1. Purpose:

To obtain staffing information for use in the CFPF economic analysis.

2. Persons Contacted:

LTC J. Turner, Chief Sys Dev Div, Concept & Sys Dir, TSA
MAJ P. B. Belcher, Food Service Officer, Sys Dev Div
Ms. Emile Prior, Management Specialist, Sys Dev Div

3. Discussion:

TDA's for the various sized facilities being considered in the CFPF economic analysis were reviewed with TSA personnel and modified as appropriate. The inclosures show the resulting TDA's that will be used in the economic analysis. Inclosure 1 is a summary tabulation and inclosure 2 is a detailed tabulation.

2 Incls
as

RONALD L. BUSTEAD
Operations Research Analyst

Approved by:

GERALD HERTWECK, Supv
Operations Research Analyst

CF:

Adjutant

Army Rep., JTS

LTC Turner, TSA (3 Copies)

MAJ P. B. Belcher, TSA

Ms. Emile Prior, TSA

Dr. Robert Davis, UMass

Mr. Robert Bourassa

TABLE C.5 (2 of 5)

STAFFING SUMMARY FOR VARIOUS SIZED CFPF'S

<u>Description</u>	<u>Par.</u>	<u>Meals/Day</u>			
		<u>25-30k</u>	<u>15.6k</u>	<u>10.5k</u>	<u>6.6k</u>
Office of Director	01	3	3	3	3
Ofc Sub Total	0 CFPF	3	3	3	3
Tech Support Office	02	2	2	(2)	(1)
QC/Micro Br	02A	9	8	(7)	(7)
Internal San Br	02B	11	10	(8)	(8)
Ofc Sub Total	ALL CFPF	22	20	17	16
Support Division	03	11	9	8	(8)
Training Br. (or 06)	03B	6	4	3	(1)
Sub-Sub Total		-	-	-	9
Troop Ls Subs Br	03A	40	35	29	24 (29)*
Div Sub Total		57	48	40	32
Chargeable to CFPF		12(3+6+3)	7(1+4+2)	5(0+3+2)	3(0+1+2)
Dining Facilities Div					
Dining Facilities Div	04	Not Considered Here			
Central Food Div	05	6	5	4	4
Ofc Sub Total		6	5	4	4
Food Prep Br	05A	3	2	(1)	(0)
Agred Scaling Sec	05B	3	2	(2)	(2)
Veg/Salad Sec	05C	17	8	(8)	(8)
Branch Sub Total		-	-	11	10
Main Kit Sec (Br last 2)	05E	14	10	(9)	(9)
Dessert Sec	05D	9	8	(7)	(6)
Packaging Sec	05F	8	5	(5)	(5)
Equip Wash Sec	05G	3	2	(2)	(2)
Rec/Stor/Dist Br	05H	7	5	(2)	(2)
Branch Sub Total		-	-	25	24
Div Sub Total	ALL CFPF	70	47	40	39
CFPF Total (W/o D.F.'s)		152	118	100	91
Total Attributable to CFPF		104	74	62	58

() Not a separate element but identified with the function.

() *Now at Fort Lee but 5 are at satellite bases.

TABLE C.5 (3 of 5)

DETAIL STAFFING FOR VARIOUS SIZED CFPF'S
(As modified during 31 Aug meeting at Ft. Lee)

Par/Descr	Job	Grade	Meals/Day				Category***
			25-30k	15.5k	10.5k	6.5k	
01 Dir Ofc	Chief	QM05	1	1	1	1	S
	Prog Mar	GS15	1	1	1	1	O
	Secy-Steno	GS6	1	1	1	1	O
			<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	
02 Tech Spt	Supv Fd Tech	GS12	1	1	1	1	S
	Clerk-Steno	GS4	1	1	1	0	O
			<u>2</u>	<u>2</u>			
02A QC/MICRO	Supv Fd Tech	GS11	1	0	0	0	S
	Prev Med Insp	E7	1	1	1	1	O
	Food Insp Sp	E6	1	1	1	1	O
	Food Insp Sp	E5	2	2	1	1	O
	Microbid	GS11	1	1	1	1	O
	Bio Lab Tech	GS7	1	1	1	1	O
	Bio Lab Tech	GS5	2	2	2	2	O
			<u>9</u>	<u>8</u>			
02B Int San	San Supv	GS7	1	1	1	1	S
	Fd Svc Wk Ldr	WL2	2	2	2	2	k
	Fd Svc Wkr	WG2	4	1	0	0	k
	Janitor	WG2	4	6	5	5	k
			<u>11</u>	<u>10</u>	<u>17</u>	<u>16</u>	
03 SPT DIV	Chief	GS12*	1	1	1	1(11)	S
	**Mgt Anal	GS9	1	1	0	0	O
	Budget Anal	GS9	1	1	1	1	O
	Log Spt Ofcr	GS11*	1	1(9)	1(9)	1(9)	O
	Supply Clk	GS5	1	1	1	1	O
	Clk-Steno	GS4	1	1	1	1	O
	**Prop Bk Clk	E5	1	0	0	0	O
	**Fd Eq Mech	WG10	1	0	0	0	O
	Mtr Veh Op	GS5	1	1	1	1	d
	Whsmn	GS4	2	2	2	2	w
			<u>11</u>	<u>9</u>	<u>8</u>		
03B TRNG (reversed w/03A)	Trng Ofcr	QM03	1	1	1	1	O
	Pers Mgt Sp	E5	1	1	0	0	O
	Instr-Gar	E8	2	1	1	0	O
	Instr-Fld	E8	2	1	1	0	O
			<u>6</u>	<u>4</u>	<u>3</u>	<u>9</u>	
			<u>17</u>	<u>15</u>	<u>11</u>		

Par/Descr	Job	Grade	Meals/Day				Categor
			25-30k	15.6k	10.5k	6.6k	
TRP ISS	Chief	GS10	1	1	1	1	S
	**Rat Dist Sgt	E8	1	0	0	0	O
	Clk-Typ	GS3	1	1	1	1	O
	Acc Main Clk	GS3	2	2	2	2	O
	Acc Main Clk	GS4	2	2	1	1	O
	Supply Clk-Ren	GS3	3	2	2	2	O
	Supply Clk-Gen	GS4	2	2	1	1	O
	Supply Clk-Typ	GS3	2	2	2	2	O
	Whsmm Fmn	WS9	0	1	1	(1)	W
	Whsmm Fmn	WS8	2	0	0	0	W
	Whsmm Fmn	WS6	2	2	1	(1)	W
	Whsmm Fmn	WS5	0	2	2	(2)	W
	Whsmm Fl Ft	WG6	6	3	3	3	W
	Whsmm	WG6	6	3	3	3	W
	Whsmm PPT	WS4	3	3	3	3	W
	Mtr Veh Op	E4	4	0	0	0	d
	**Mtr Veh Op	WG8	2	2	2	2	d
	Mtr Veh Op	WG6	0	1	1	(1)	d
	Mtr Veh PPT	WG6	0	1	1	1	d
			<u>40</u>	<u>35</u>	<u>29</u>	<u>24</u>	(29 w/Lee satellites)

04 DIN FAC

Not Considered Here

* CEN PREP

Chief	QM04	1	1	1	1	S
Fd Svc Supv	E9	1	0	0	0	O
Ind Eng-Prod	GS12	1	1	1	1	O
Prod Tech	GS7	1	1	0	0	O
Acc Main Clk	GS3	1	1	1	1	O
Secy-Steno	GS3	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	O
		6	3	4	4	

** OSA FD PREP

Supv Fd Tech	GS12	1	1(11)	1(11)	1(11)	S
Fd Supv	E8	1	1	0	0	S
Secy-Steno	GS4	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	O
		3	2			

** OSB SCALING

Sr Cook	E5	1	1	1	1	C
Fd Svc Wkr	WG3	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	K
		3	2			

** OSC VEG/SLD

First Cook	E6	0	0	1	1	S
Sr Cook	E5	3	2	0	0	C
Cook	E4	7	0	2	2	C
Cook Ldr	WL8	0	0	1	1	C
Cook PPT	WG5	0	0	1	1	C
Fd Wrk Ldr	WL5	2	1	0	0	K
Fd Svc Wkr	WG3	2	2	1	1	K
Fd Svc Wkr	WG2	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	K
		17	8			

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<u>23</u>	<u>12</u>	<u>11</u>	<u>11</u>
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TABLE 2.5 (2 of 5)

Par/Descr	Job	Grade	Meals/Day				Category
			25-30k	15.6k	10.5k	6.6k	
**OSD DESSERT	Pastry Chief	WL3	1	1	1	1	C
	Pastry Cook	WG3	2	2	2	2	C
	Pastry Cook	WG5	4	4	3	2	C
	Fd Svc Wkr	WG2	2	1	1	1	K
			<u>9</u>	<u>8</u>			
**OSE MAIN KIT	NCOIC	E8	1(7)	1(7)	1	1	S
	First Cook	E6	0	0	1	1	C
	Sr Cook	E5	2	2	2	2	C
	Cook	E4	2	1	0	0	C
	Cook	E3	0	0	2	2	C
	Cook	WG5	3	3	3	3	C
	Cook	WG4	2	0	0	0	C
	Cook	WG2	4	3	0	0	C
			<u>14</u>	<u>10</u>			
**OSF PKCG	Fd Wkr Ldr	WL2	1	1	1	1	K
	Fd Svc Wkr	WG2	7	4	4	4	K
			<u>8</u>	<u>5</u>			
**OSG EQUIP WASH	Fd Wkr Ldr	WL2	1	1	0	0	K
	Fd Svc Wkr	WG2	2	1	2	2	K
			<u>3</u>	<u>2</u>			
**OSH STORAGE	Chief	WS8	1	1	0	0	S
	Whsmns FLPT	WG6	2	2	0	0	W
	Whsmn	WG5	4	2	0	0	W
	Whsmn	WG4	0	0	2	2	W
			<u>7</u>	<u>5</u>			
			<u>41</u>	<u>30</u>	<u>25</u>	<u>24</u>	

*Grade Change

**Chargeable to CFPF

***S = Supervisor; O = Overhead; W = Warehousing; d = Drive; C = Cook; K = Food Service Worker

TAP C.6

SUMMARY OF CFF ADDITIONAL STAFFING REGIONAL ANALYSIS-30000 HEALS/DAY FIRST SHIFT

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
OS	0	0	2	4	0	3	0	1	0	2	3	15
U	0	1	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	9	8	3	1	7	1	0	0	0	29
WS	0	0	0	0	0	0	0	0	0	0	0	1
WL	0	0	0	2	0	0	1	0	0	0	0	7
WO	0	4	2	11	2	0	4	0	1	0	0	50
	26											
TOTAL												104

SUMMARY OF CFF ADDITIONAL STAFFING REGIONAL ANALYSIS-15000 HEALS/DAY SECOND SHIFT

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
OS	0	0	0	2	0	0	0	0	0	0	0	2
U	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	1	6	1	0	2	0	0	0	0	10
WS	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	0	0	1	0	0	1	0	0	0	0	4
WO	0	2	0	9	2	0	2	0	1	0	0	29
	12											
TOTAL												46

TOTAL: FIRST AND SECOND SHIFTS 150

TABLE C.7

COST OF CFFP ADDITIONAL STAFFING
REGIONAL ANALYSIS - 30000 MEALS/DAY
FIRST SHIFT

JOB CLASSIFICATION	GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
OS	0	0	0	23132	51752	0	48075	0	19603	0	47440	85281	275283
U	0	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	80622	85384	37989	15192	124439	21415	0	0	0	365041
WB	0	0	0	0	0	0	0	26830	0	0	0	0	26830
WL	0	62220	0	0	37760	0	0	22204	0	0	0	0	122184
WU	0	367588	60600	32266	188914	36314	0	80724	0	22204	0	0	788610
										COST OF GRADE DIFFERENTIAL (B)			8824
													TOTAL 1634153

COST OF CFFP ADDITIONAL STAFFING
REGIONAL ANALYSIS - 15000 MEALS/DAY
SECOND SHIFT

JOB CLASSIFICATION	GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
OS	0	0	0	0	27170	0	0	0	0	0	0	0	27170
U	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	8958	64038	12663	0	35554	0	0	0	0	121213
WB	0	0	0	0	0	0	0	28842	0	0	0	0	28842
WL	0	33444	0	0	20296	0	0	23069	0	0	0	0	77609
WU	0	182376	48858	0	166158	39038	0	43390	0	23069	0	0	503689
										COST OF GRADE DIFFERENTIAL (B)			0
													TOTAL 758523

TOTAL: FIRST AND SECOND SHIFTS 1634153

TABLE C.8

SUMMARY OF CFFP ADDITIONAL STAFFING REGIONAL ANALYSIS - 30000 MEALS/DAY FIRST SHIFT

JOB CLASSIFICATION	GRADE												SUBTOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
GS	0	0	0	2	4	0	3	0	1	0	2	3	15
U	0	0	1	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	9	8	3	1	7	1	0	0	0	29
WS	0	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	4	0	0	2	0	0	1	0	0	0	0	7
WB	0	26	4	2	11	2	0	4	0	1	0	0	50
TOTAL													104

SUMMARY OF CFFP ADDITIONAL STAFFING REGIONAL ANALYSIS - 30000 MEALS/DAY SECOND SHIFT

JOB CLASSIFICATION	GRADE												SUBTOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	
GS	0	0	0	0	2	0	0	0	0	0	0	0	2
U	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	9	7	1	0	2	0	0	0	0	19
WS	0	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	2	0	0	2	0	0	1	0	0	0	0	5
WB	0	18	4	2	11	2	0	2	0	1	0	0	40
TOTAL													67
TOTAL: FIRST AND SECOND SHIFTS													171

**COST OF CFF ADDITIONAL STAFFING
REGIONAL ANALYSIS- 30000 HEALB/DAY
FIRST SHIFT**

JOB	GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
OS	0	0	0	23132	51752	0	48075	0	19603	0	47440	85281	275283
O	0	0	21395	25980	0	0	0	0	0	0	0	0	47383
M	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	80622	85304	37989	15192	124439	21415	0	0	0	365041
WB	0	0	0	0	0	0	0	26830	0	0	0	0	26830
WL	0	62220	0	0	37760	0	0	22204	0	0	0	0	122184
WD	0	367588	60600	32266	108914	36314	0	80724	0	22204	0	0	780610
									COST OF GRADE DIFFERENTIAL(B)				8824

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TOTAL	1634135
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COST OF CPE ADDITIONAL STAFFING
REGIONAL ANALYSIS - 30000 HEALTH/DAY
SECOND SHIFT

JOB CLASSIFICATION	GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
UG	0	0	0	0	27170	0	0	0	0	0	0	0	27170
U	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	80622	74711	12663	0	35554	0	0	0	0	203550
WB	0	0	0	0	0	0	0	28842	0	0	0	0	28842
ML	0	33444	0	0	40592	0	0	23869	0	0	0	0	97905
WD	0 - 273564	65144	34686	203082	39038	0	0	43390	0	23869	0	0	682773
									COST OF GRADE DIFFERENTIAL(B)				0

TOTAL	1040240
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TOTAL FIRST AND SECOND SHIFTS 2874395

SUMMARY OF CFF ADDITIONAL STAFFING
FORT LEE-- 6250 MEALS/DAY

[illegible]

**COST OF CFF ADDITIONAL STAFFING
FOR LEE- 6250 MEALS/DAY**

JOB CLASSIFICATION		GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
US	0	0	0	0	0	51752	0	0	0	0	0	23720	56854	132326
U	0	0	21395	25988	0	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	26874	32019	37989	30384	17777	0	0	0	0	0	145043
MS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WL	0	31110	0	0	18880	0	0	44408	0	0	0	0	0	94390
WG	0	98966	30300	32266	68696	0	0	60543	0	0	0	0	0	290771
COST OF GRADE DIFFERENTIAL(S)														0
TOTAL SAVINGS DUE TO USE OF FFT WORKER(S)														709921
TOTAL INCLUDING FFT SAVINGS														429
														709492

TABLE C.11

SUMMARY OF CFF ADDITIONAL STAFFING
FOR CARSON- 10841 MEALS/DAY

[illegible]

**COST OF CFFP ADDITIONAL STAFFING
FORT CARSON- 10841 MEALS/DAY**

JOB CLASSIFICATION	GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
GS	0	0	0	11546	51752	0	0	0	0	0	23720	54854	143092
U	0	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	26874	32019	37989	30384	35554	0	0	0	0	162020
MS	0	0	0	0	0	0	0	0	0	0	0	0	0
WL	0	34348	0	0	19111	0	0	42154	0	0	0	0	95613
WG	0	171732	32382	33538	86880	0	0	57420	0	0	0	0	301952
									COST OF GRADE DIFFERENTIAL(S)				4707
									TOTAL SAVINGS DUE TO USE OF PPT WORKER(S)				836367
									TOTAL INCLUDING PPT SAVINGS				835933

[illegible]

**COST OF CFFF ADDITIONAL STAFFING
FORT LEWIS- 16362 MEALS/DAY**

GRADE 1		2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION													
GS	0	0	0	11566	51752	0	16025	0	19603	0	47440	56854	203240
0	0	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	26874	53365	37989	15192	71108	0	0	0	0	204528
WS	0	0	0	0	0	0	0	30705	0	0	0	0	30705
WL	0	62364	0	0	46374	0	0	25587	0	0	0	0	134325
WG	0	226560	39204	20354	168416	21800	0	69822	0	0	0	0	546356
COST OF GRADE DIFFERENTIAL(S)													4707
TOTAL													1171244
SAVINGS DUE TO USE OF PFT WORKER(S)													527
TOTAL INCLUDING PFT SAVINGS													1170717

TABLE C.13

C.13 - 302

SUMMARY OF CFF ADDITIONAL STAFFING
FORT KNOX - 23384 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GS	0	0	2	4	0	2	0	1	0	1	3	13
U	0	1	1	0	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	4	7	3	1	5	1	0	0	0	21
WS	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	0	0	3	0	0	1	0	0	0	0	7
WB	0	4	2	9	2	0	3	0	0	0	0	38
	18											
TOTAL												82

COST OF CFF ADDITIONAL STAFFING
FORT KNOX - 23384 MEALS/DAY

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GS	0	0	23132	51752	0	32050	0	19603	0	23720	85201	235538
U	0	21395	25988	0	0	0	0	0	0	0	0	47383
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	35832	74711	37989	15192	88885	21415	0	0	0	274024
WS	0	0	0	0	0	0	26252	0	0	0	0	26252
WL	0	50655	0	58200	0	0	21829	0	0	0	0	130684
WB	0	276336	64416	158463	36660	0	59502	0	0	0	0	629089
												8824
COST OF GRADE DIFFERENTIAL (\$)												

TOTAL 1351794
SAVINGS DUE TO USE OF PFT WORKER(S) 440
TOTAL INCLUDING PFT SAVINGS 1351794

TABLE C.14 (1 of 4)

STAFFING SUMMARY FOR VARIOUS SIZED CFPF'S

<u>Description</u>	<u>Par.</u>	<u>Meals/Day</u>			
		<u>25-30k</u>	<u>15.6k</u>	<u>10.5k</u>	<u>6.6k</u>
Office of Director	01	3	3	3	3
Ofc Sub Total	0 CFPF	3	3	3	3
Tech Support Office	02	2	2	(2)	(1)
QC/Micro Br	02A	8	7	(6)	(6)
Internal San Br	02B	0	0	0	0
Ofc Sub Total	ALL CFPF	10	9	8	7 ALL CFPF
Support Division	03	10	8	7	(7)
Training Br (or 06)	03B	4	3	2	(1)
Sub-Sub Total		-	-	-	8
Troop Is Subs Br	03A	37	33	27	23 (28)*
Div Sub Total		51	44	36	31
Chargeable to CFPF		7(2.4.1)	5(1.3.1)	3(0.2.1)	2(0.1.1) CFPF
Dining Facilities Div	04	Not Considered Here			
Central Food Div	05	6	5	4	4
Ofc Sub Total		6	5	4	4
Food Prep Br	05A	3	2	(1)	(1)
Ingred Scaling Sec	05B	3	2	(2)	(2)
Veg/Salad Sec	05C	12	8	(7)	(6)
Branch Sub Total		-	-	10	9
in Kit Sec (Br last 2)	05E	12	10	8	7
Assert Sec	05D	8	7	6	5
Packaging	05F	6	4	4	3
Equip Wash Sec/Sanitation	05G	10	8	6	5
Rec/Stor/Dist Br	05H	5	3	(2)	(2)
Branch Sub Total		41	32	26	22
Div Sub Total	ALL CFPF	65	49	40	35 ALL CFPF
CFPF Total (w/o D.F.s)		124	105	87	75
Total Attributable to CFPF		82	63	51	44

() Not a separate element but identified with the function.

() *Now at Fort Lee but 5 are at satellite bases.

TABLE C.14 (2 of 4)
 DETAIL STAFFING FOR VARIOUS SIZED CFPFs
 (As modified during 31 Aug meeting at Ft. Lee)

Par/Descr	Job	Grade	Meals/Day				Category***
			25-30k	15.6k	10.5k	6.6k	
01 Dir Ofc	Chief	QM05	1	1	1	1	S
	Prog Manager	GS13	1	1	1	1	0
	Secy-Steno	GS6	1	1	1	1	0
			<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	
**02 Tech Spt	Supv Fd Tech	GS12	1	1	1	1	S
	Clerk-Steno	GS4	1	1	1	0	0
			<u>2</u>	<u>2</u>			
**02A QC/MICRO	Supv Fd Tech	GS11	0	0	0	0	S
	Prev Med Insp	E7	1	1	1	1	0
	Food Insp Sp	E6	1	1	1	1	0
	Food Insp Sp	E5	2	2	1	1	0
	Microbid	GS11	1	1	1	1	0
	Bio Lab Tech	GS7	1	0	0	0	0
	Bio Lab Tech	GS5	2	2	2	2	0
			<u>8</u>	<u>7</u>	<u>6</u>	<u>6</u>	
03 SPT DIV	Chief	GS12*	1	1	1	1(11)	S
	**Mgt Anal	GS9	1	1	0	0	0
	Budget Anal	GS9	1	1	1	1	0
	Log Spt Ofcr	GS11*	1	1(9)	1(9)	1(9)	0
	Supply Clk	GS5	1	1	1	1	0
	Clk-Steno	GS4	1	1	1	1	0
	**Prop Bk Clk	E5	1	0	0	0	0
	**Fd Eq Mech	WG10	0	0	0	0	0
	Mtr Veh Op	GS5	1	1	1	1	d
	Whsmn	GS4	2	1	1	1	w
			<u>10</u>	<u>8</u>	<u>7</u>	<u>(7)</u>	
**03B TRNG (reversed w/03A)	Trng Ofcr	QM03	1	1	1	1	0
	Pers Mgt Sp	E5	0		0	0	0
	Instr-Gar	E8	1	1	1	0	0
	Instr-Fld	E8	2	1	0	0	0
			<u>4</u>	<u>3</u>	<u>2</u>	<u>0</u>	
			<u>14</u>	<u>11</u>	<u>9</u>	<u>8</u>	

Par/Descr	Job	Grade	25-30k	Meals/Day			Category	
				15.6k	10.5k	6.6k		
03A TRP ISS	Chief	GS10	1	1	1	1	S	
	Clk-Typ	GS3	1	1	1	1	O	
	Supv Acc Clk	GS7	1	1	1	1	S	
	Acc Main Clk	GS5	2	2	1	1	O	
	Acc Main Clk	GS4	2	2	1	1	O	
	Supply Clk-Rqn	GS5	3	2	2	2	O	
	Supply Clk-Gen	GS4	2	2	1	1	O	
	Supply Clk-Typ	GS3	2	2	2	2	O	
	Whsmn Fmn	WS9	1	1	0	(1)	W	
	Whsmn Fmn	WS8	1	0	1	0	W	
	Whsmn Fmn	WS6	2	2	1	1	W	
	Whsmn Fmn	WS5	0	2	2	(2)	W	
	Whsmn Fl Ft	WG6	5	4	3	3	W	
	Whsmn	WG6	6	5	4	5(1)	W	
						4+(1)		
	Whsmn PPT	WS4	3	3	3	3	W	
	Mtr Veh Op	E4	2	0	0	0	d	
	**Mtr Veh Op	WG8	1	1	1	1	d	
	Mtr Veh Op	WG6	2		1	(1)	d	
	Mtr Veh PPT	WG6	0	1	1	1	d	
				37	35	29	23	(28 w/Lee satellites) (1)

04 DIN FAC

Not Considered Here

**05 CEN PREP

Chief	QM04	1	1	1	1	S
Fd Svc Supv	E9	1	0	0	0	O
Ind Eng-Prod	GS12	1	1	1	1	O
Prod Tech	GS7	1	1	0	0	O
Acc Main Clk	GS5	1	1	1	1	O
Secy-Steno/Clerk	GS5	1	1	1	1	O
		6	5	4	4	

**05A FD PREP

Supv Fd Tech	GS12	1	1(11)	0	0	S
Fd Supv	E8	1	1	1	1	S
Secy-Steno	GS4	1	0	0	0	O
		3	2			

**05B SCALING

Sr Cook	E5	1	1	1	1	c
Fd Svc Wkr	WG3	2	1	1	1	k
		3	2			

**05C VEG/SLD

First Cook	E6	1	1	1	1	S
Sr Cook	E5	2	1	0	0	C
Cook	E4	2	1	1	1	C
Cook Ldr	WL8	0	0	1	1	C
Cook PPT	WG5	1	1	1	1	C
Fd Wrk Ldr	WL5	2	1	0	0	K
Fd Svc Wkr	WG3	2	1	1	1	K
Fd Svc Wkr	WG2	2	2	2	1	K
		12	8	(7)	(6)	

18 12 10 9

CENT PREP

SUBTOTAL

24 17 14 13

TABLE C.14 (4 of 4)

<u>Par/Descr</u>	<u>Job</u>	<u>Grade</u>	<u>Meals/Day</u>				<u>Category</u>
			25-30k	15.6k	10.5k	6.6k	
**05D DESSERT	Pastry Chief	WL8	1	1	1	1	C
	Pastry Cook	WG8	2	2	2	2	C
	Pastry Cook	WG5	3	3	2	1	C
	Fd Svc Wkr	WG2	2	1	1	1	K
			8	7	(6)	(5)	
**05E MAIN KIT	NCOIC	E8/7	1(3)	1(8)	1 (7)	1(7)	S
	First Cook	E6	1	1	1	1	C
	Sr Cook	E5	1	1	1	1	C
	Cook	E4	2	2	2	2	C
	Cook	E3	0	0	0	0	C
	Cook	WG5	3	3	2	2	C
	Cook	WG4	2	1	0	0	C
	Cook	WG2	2	1	1	0	C
			12	10	(8)	(7)	
**05F PKGG	Fd Wkr Ldr	WL2	1	1	1	1	K
	Fd Svc Wkr	WG2	5	3	3	2	K
			6	4	(4)	(3)	
**05G EQUIP WASH	Fd Wkr Ldr	WL2	1	1	0	0	K
	Fd Svc Wkr	WG2	2	1	2	2	K
			3	2			
**05H STORAGE	Chief	WS8	1	1	0	0	S
	Whsms FLFT	WG6	2	1	0	0	W
	Whsmn	WG5	2	1	0	0	W
	Whsmn	WG4	0	0	2	2	W
			5	3			
			41	32	26	22	
*Grade Change							
**Chargeable to CFPF							
TOTAL CK			65	49	40	35	
***S=Supervisor; O=Overhead; W=Warehousing; d=Drive; C=Cook; K=Food Service Worker							
TSO SA DIV			17	14	11	9	
TOTAL CFPF			82	63	51	44	

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NOT FOR PUBLICATION

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JOH
CLASSIFICATION

TOTAL.

123

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COST OF EFF ADDITIONAL STAFFING
REGIONAL ANALYSIS- 30000 HEALS/DAY
FIRST SHIFT

JOB CLASSIFICATION		GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SURTOTAL
GS	0	0	0	23132	51752	0	32050	0	19603	0	23720	85281	0	235538
0	0	0	21395	25988	0	0	0	0	0	0	0	0	0	47383
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	35832	74711	37989	15192	80885	21415	0	0	0	0	274024
WS	0	0	0	0	0	0	0	0	0	0	0	0	0	26830
HL	0	46665	0	0	56640	0	0	22204	0	0	0	0	0	125509
UG	0	254484	60600	32266	154566	36314	0	60543	0	0	0	0	0	598775
														COST OF GRADE DIFFERENTIAL (\$)
														8824

SAVINGS IN/RE-TO USE OF PFT WORKER(S)	4:9
TOTAL	1316881

TOTAL INCLUDING FFR SAVINGS 1316452

COST OF CFFF ADDITIONAL STAFFING
REGIONAL ANALYSIS-- 15000 MEALS/DAY
SECOND SHIFT

JOB CLASSIFICATION	GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
GS	0	0	0	0	27170	0	0	0	0	0	0	0	27170
U	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	26874	42692	37909	0	35534	0	0	0	0	143109
MS	0	0	0	0	0	0	0	28842	0	0	0	0	28842
ML	0	33444	0	0	20296	0	0	23869	0	0	0	0	77609
MB	0	121584	32572	17343	147696	19519	0	43390	0	0	0	0	382104
									COST OF GRADE DIFFERENTIAL(S)				0

SAVINGS DUE TO USE OF PPT WORKER(S)	TOTAL	658834	462
-------------------------------------	-------	--------	-----

TOTAL INCLUDING PFI SAVINGS 6.18%

TOTAL: FIRST AND SECOND GOLF IS 19740.4

SUMMARY OF CFFP ADDITIONAL STAFFING
REGIONAL ANALYSIS- 30000 MEALS/DAY
FIRST SHIFT

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GS	0	0	2	4	0	2	0	1	0	1	3	13
W	0	1	1	0	0	0	0	0	0	0	0	2
E	0	0	0	0	0	0	0	0	0	0	0	0
WS	0	0	4	7	3	1	5	1	0	0	0	21
WL	0	0	0	0	0	0	1	0	0	0	0	1
WU	3	0	0	3	0	0	1	0	0	0	0	7
	18	4	2	9	2	0	3	0	0	0	0	38
TOTAL												82

SUMMARY OF CFFP ADDITIONAL STAFFING
REGIONAL ANALYSIS- 30000 MEALS/DAY
SECOND SHIFT

GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
JOB CLASSIFICATION												
GS	0	0	0	2	0	0	0	0	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	4	5	3	0	2	0	0	0	0	14
WS	0	0	0	0	0	0	1	0	0	0	0	1
WL	0	0	0	2	0	0	1	0	0	0	0	5
WU	13	4	2	9	2	0	2	0	0	0	0	32
TOTAL												54

TOTAL : FIRST AND SECOND SHIFTS

136

TABLE C.18
COST OF CFTT ADDITIONAL STAFFING
REGIONAL ANALYSTS- 30000 HEALS/DAY
FIRST SHIFT

[illegible]

COST OF LIFE ADDITIONAL STAFFING
REGIONAL ANALYSIS- 30000 MEALS/DAY
SECOND SHIFT

JOB CLASSIFICATION		GRADE 1	2	3	4	5	6	7	8	9	10	11	12	SUBTOTAL
OS	0	0	0	0	0	27170	0	0	0	0	0	0	0	27170
U	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	35832	53365	37989	0	35554	0	0	0	0	0	162740
WS	0	0	0	0	0	0	0	28842	0	0	0	0	0	28842
WL	0	33444	0	0	40592	0	0	23869	0	0	0	0	0	97905
WG	0	197574	65144	34686	166158	39038	0	43390	0	0	0	0	0	545990
COST OF GRADE DIFFERENTIAL(S)														0
TOTAL SAVINGS DUE TO USE OF PPT WORKER(S)														862647
TOTAL INCLUDING PPT SAVINGS														8621
TOTAL: PPT: GRD SECOND SHIFTS														2178637

APPENDIX D

FOOD COST AND MEAL COUNT DATA

D. FOOD RELATED DATA

Some of the food service characteristics of the U.S. Army posts that are utilized in this evaluation are summarized in Table D.1. The data source for Table D.1 is DA Form 2969 for CY77; Total Man-Days fed, Food Cost, National Guard and Reserve Man-Days, Authorized Man-Days, and Cash, Transient and MPV Man-Days are actual numbers reported on this form. NOTE: Man-Days as reported are actually rations as used in this report. The other terms were obtained as follows:

1. CFPF Man-Days: Total Man-Days minus National Guard and Reserve Man-Days.
2. CFPF Food Cost: Total Food Cost for each month multiplied by the ratio of CFPF Man-Days to Total Man-Days. The total is factored down to exclude National Guards and Reserves who have been excluded from the analysis.
3. Excl Cash Man-Days: obtained by subtracting Cash, Trans & MPV Man-Days from Total Man-Days. These customers were excluded to obtain participation since they are not counted in authorized Man-Days.
4. Percent Partic: Ratio of Excl Cash Man-Days to Authorized Man-Days expressed as a percentage.

Since the July '77 DA Form 2969 for Vint Hill Farms was not available, the CFPF Man-Days for this month were taken as 4084, the average of June and August 1977. The corresponding food cost in July was computed to be \$11,832, obtained by multiplying the average food cost per ration for the eleven months for which information was available by the assumed man-days for July.

Since DA Forms 2969 were not available for Quantico and the Naval Bases, reasonable estimates were made based on the data that were available.

For Quantico, the only information available was the average rations served per day at each of the DFs on the base. For the Naval bases, the only information available was the average rations served per day on the base and the number of DFs on the base. This latter information was supplied by Mr. R. Bustead (NARADCOM), telephone conversation 4 October 1978. A summary appears in Table D.2. The 1977 CFPF food costs for both the Marine and Navy bases were obtained by multiplying the projected annual rations served at these bases (based on the information provided) by the average food cost per ration computed by combining the ten bases in Table D.1.

Food costs for CY77 obtained on the basis of the above assumptions are

Ft. Lee	\$ 2,191,646
Ft. Carson	3,839,043
Ft. Lewis	5,965,763
Ft. Knox	8,369,247
Region I	16,174,938
Region II	21,850,921

These costs were then updated for the analysis to reflect prices in 1978 as follows:

For Fts. Carson, Knox, and Lewis the CFPF food cost was computed by factoring up the CFPF food cost for CY77 by the percentage increase in cost per meal experienced during the first nine months of 1978 (most recent data available). Data for the cost in 1978 was obtained from DA

Form 2969 and is summarized in Table D.3. Updated costs for Ft. Lee were not similarly computed since Ft. Lee now operates under a CFPF mode and so the food costs at Ft. Lee in 1978 would be biased.

In order to compute the updated costs for Ft. Lee, Region I, and Region II, the costs for CY77 were increased by the percentage increase in cost per meal for Fts. Carson, Lewis and Knox combined.

These updated costs are the 'Conventional Food Cost' in Table D.4 which also gives the summary of food savings due to the CFPF system.

Following discussions with TSA and NARADCOM, a 30 day inventory requirement was assumed for the food prepared by the CFPF. The cost of carrying the inventory is charged at 10%, consistent with the accepted interest rate for capital.

'Net Savings' is the food savings minus the cost of carrying inventory.

TABLE D.1 (1 of 5)
SUMMARY OF DATA RELATED TO FOOD COST AND CONSUMPTION
Obtained from Form A Form 2009

FORT LEE

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFPF MAN-DAYS	CFPF FOOD COST	AUTHORIZED MAN-DAYS	CASH, TRANS & MPV MAN-DAYS	EXCL CASH MAN-DAYS	PERCENT PARTIC
1977										
JAN	77985	201658	2.59	14650	43335	163775	111564	4087	73898	66
FEB	48597	182483	2.66	12847	55750	148307	104952	4287	44310	61
MAR	83766	239530	2.86	12369	71377	204160	107920	5802	77964	72
APR	85751	239160	2.79	10360	75391	210265	116876	5753	79990	68
MAY	79779	218982	2.74	11340	68439	187855	120904	4002	75777	63
JUN	79658	223505	2.81	10091	69567	195261	90794	8534	71124	78
JUL	57034	165667	2.90	9458	47376	137613	99174	4220	52814	53
AUG	43314	185035	2.92	10674	52640	153840	99451	6248	57065	57
SEP	100649	291380	2.90	8619	92030	266427	138471	17721	82928	66
OCT	78603	226654	2.88	10363	68240	196771	113025	6451	72152	64
NOV	77013	232516	2.99	11346	66467	198612	115219	5749	72064	63
DEC	51865	151305	2.92	7728	44137	128760	80394	3810	48055	60
TOTAL	904814	2557955	2.83	130045	774769	2191646	1298746	76664	828150	64

FORT CARSON

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFPF MAN-DAYS	CFPF FOOD COST	AUTHORIZED MAN-DAYS	CASH, TRANS & MPV MAN-DAYS	EXCL CASH MAN-DAYS	PERCENT PARTIC
1977										
JAN	123843	306025	2.47	155	123688	305641	233618	18458	105385	45
FEB	106210	290344	2.73	316	105894	289480	210315	15676	90534	43
MAR	131830	379365	2.88	96	131734	379080	231857	29109	102721	44
APR	126711	376654	2.97	237	126474	375949	230186	24988	101723	44
MAY	135778	366399	2.70	1161	134617	363266	240020	21353	114425	48
JUN	110273	328514	2.98	1950	108323	322704	217740	11222	99051	45
JUL	100017	304833	3.05	437	99500	303501	227343	11956	88061	39
AUG	110192	327348	2.97	1845	100347	321867	190978	16348	93044	47
SEP	96071	274907	2.86	505	95566	273461	190016	20601	75470	40
OCT	111659	340346	3.12	340	111311	347260	212192	21906	89753	42
NOV	102315	314380	3.07	157	102158	313905	201617	17609	84626	42
DEC	89164	243410	2.73	182	88982	242921	199649	17664	71500	36
TOTAL	1344063	3060541	2.87	7389	1336674	3039043	2593531	226970	1117093	43

TABLE J.1 (CONT 2 of 5)

FORT LEWIS

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFFP MAN-DAYS	CFFP FOOD COST	AUTIDRISED MAN-DAYS	CASH, TRANS & MPV MAN-DAYS	EXCL CASH MAN-DAYS	PERCENT PARTIC
1977										
JAN	151421	405339	2.68	252	151169	404664	270635	14872	134549	50
FEB	154357	441225	2.86	248	154109	440516	258489	17679	136678	53
MAR	190517	562105	2.95	311	190206	561187	312703	23225	167292	53
APR	184319	551137	2.99	892	183427	548469	304264	25864	158455	52
MAY	182700	512275	2.80	4904	177796	498524	324502	20871	161829	50
JUN	179539	523701	2.92	25623	153916	448960	301772	16597	162942	54
JUL	152508	400186	3.15	12234	140274	441666	294694	16660	135848	44
AUG	198673	619098	3.12	8496	190177	592623	311773	26403	172270	55
SEP	170940	509755	2.98	798	170142	507375	294882	24454	146406	50
OCT	186189	555495	2.98	126	186063	555119	324658	22090	163299	50
NOV	177767	550817	3.10	169	177598	550293	318328	19684	158081	50
DEC	148486	416772	2.81	144	148342	416367	284269	14412	134074	47
TOTAL	2077416	6127905	2.95	54197	2023219	5965763	3600971	245613	1831803	51

FORT KNOX

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFFP MAN-DAYS	CFFP FOOD COST	AUTIDRISED MAN-DAYS	CASH, TRANS & MPV MAN-DAYS	EXCL CASH MAN-DAYS	PERCENT PARTIC
1977										
JAN	311482	860243	2.76	36023	275459	760755	349673	16674	294808	84
FEB	306373	862515	2.82	32401	273892	771073	360021	15361	291012	81
MAR	340558	997863	2.93	40138	300420	880355	428978	19565	320993	75
APR	277137	810751	2.93	30147	246990	723557	365516	7902	269235	74
MAY	254291	726134	2.86	31289	223002	636787	336636	12627	241664	72
JUN	248020	723412	2.91	33429	215391	626221	310035	16739	232081	75
JUL	280190	825956	2.95	35833	244357	720325	362587	7456	272734	75
AUG	335226	989125	2.95	44016	291210	859250	301639	10658	324560	85
SEP	272214	817199	3.00	35606	236520	710067	346416	24069	247345	71
OCT	260344	804515	3.00	36024	233320	696512	356008	15014	253330	71
NOV	240612	732197	3.04	35450	205154	624294	317322	2156	238456	75
DEC	152273	429283	2.82	24168	120105	361149	202009	6634	145639	72
TOTAL	3287520	9579193	2.91	414692	2877828	8349247	4116040	155655	3131825	76

TABLE D.1 (Cont'd 3 of 5)

FORT EUSTIS

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & REG MAN-DAYS	CPFF MAN-DAYS	CPFF FOOD COST	AUTHORIZED MAN-DAYS	CASH, TRANS & NPV MAN-DAYS	EXCL CASH MANDAYS	PERCENT PARTIC
1977										
JAN	50668	140089	2.76	1872	48796	134913	92484	4597	46071	50
FEB	44794	126451	2.83	1903	42891	121270	79213	4723	46071	51
MAR	51989	151681	2.92	2298	49691	144976	92276	5954	46035	50
APR	46162	134738	2.92	1982	44180	128952	87443	5899	40263	46
MAY	47046	136337	2.90	2298	49748	129677	84412	5896	41150	49
JUN	45421	129400	2.85	3180	42233	120317	76236	5199	40222	53
JUL	41926	132661	3.16	3335	38591	122108	81830	5133	36793	45
AUG	55394	156803	2.83	2470	52924	149811	88951	9286	46108	52
SEP	46856	141996	3.03	1479	45377	137513	79017	4436	42420	54
OCT	53715	164334	3.06	1751	51964	158977	89701	6235	47480	53
NOV	52995	157468	2.97	1324	51671	153533	97385	6100	46895	48
DEC	38597	111928	2.90	814	37783	109567	70300	3557	35040	50
TOTAL	575563	1684086	2.93	24714	550849	1611614	1019248	67015	508548	50

FORT MEADE

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & REG MAN-DAYS	CPFF MAN-DAYS	CPFF FOOD COST	AUTHORIZED MAN-DAYS	CASH, TRANS & NPV MAN-DAYS	EXCL CASH MANDAYS	PERCENT PARTIC
1977										
JAN	25998	71140	2.74	1365	24633	67404	52156	1078	24920	48
FEB	23325	67517	2.89	470	22835	66156	42847	2159	21156	49
MAR	27048	81626	3.02	946	26102	78771	49878	3202	23846	46
APR	20591	65011	3.20	1106	19485	62276	42234	2463	18128	43
MAY	21795	60839	2.79	1049	20746	57910	43098	2484	19311	45
JUN	19394	56853	2.93	2410	16976	49764	40327	1730	17664	44
JUL	19849	61475	3.10	5729	14120	43731	33653	3715	16134	48
AUG	19773	60899	3.08	4431	15342	47251	33257	4536	15237	46
SEP	17351	55193	3.18	816	16533	52590	34654	2710	14641	42
OCT	18611	56600	3.04	806	17005	54148	36324	2608	15923	44
NOV	19096	61708	3.23	556	10540	59911	36947	3351	15745	43
DEC	16142	48218	2.99	243	15909	47522	42797	2640	13502	32
TOTAL	248973	747879	3.00	19927	229046	687434	488172	32756	216217	44

TABLE D.1 (CONT 4 of 5)

FORT MYER (CAMERON STA.)

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFFP MAN-DAYS	CFFP FOOD COST	AUTHORIZED MAN-DAYS	CASH, TRANS & NPV MAN-DAYS	EXCL CASH MANDAYS	PERCENT PARTIC
1977										
JAN	34836	97601	2.80	201	34435	97037	54103	12797	22039	41
FEB	28919	88547	3.06	153	28766	88078	46993	11733	17186	37
MAR	30196	85684	2.84	290	29906	84061	52887	12850	17346	33
APR	28335	83264	2.94	287	28048	82420	52204	12142	16193	31
MAY	31816	94128	2.96	120	31696	93772	55636	12990	18826	34
JUN	32361	93910	2.90	301	32060	93036	54261	13808	18553	34
JUL	28878	85740	2.97	265	28613	84953	55241	13470	15400	28
AUG	32235	94820	2.94	143	32092	94399	49237	14406	17829	36
SEP	29531	87657	2.97	242	29289	86938	43328	13022	16509	38
OCT	28898	94887	3.35	184	28714	94270	44639	13038	15860	36
NOV	29445	94216	3.20	200	29245	93574	43629	14034	15411	35
DEC	26568	89610	3.37	188	26380	88975	45604	11480	15080	33
TOTAL	362018	1092064	3.02	2574	359444	1084315	597762	155778	206240	35

FORT BRAGG

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFFP MAN-DAYS	CFFP FOOD COST	AUTHORIZED MAN-DAYS	CASH, TRANS & NPV MAN-DAYS	EXCL CASH MANDAYS	PERCENT PARTIC
1977										
JAN	304207	820784	2.70	151	304056	820376	476948	41278	262929	55
FEB	257275	720156	2.80	75	257200	719946	436151	34186	223089	51
MAR	324311	892350	2.75	870	323441	889956	492943	25136	299175	41
APR	267451	788402	2.95	712	266739	786303	473873	20790	246661	52
MAY	263723	768998	2.90	1086	261837	763498	500205	18695	245028	48
JUN	276506	801093	2.92	3735	272771	790271	481259	16907	259599	54
JUL	240093	709701	2.96	2721	237372	701657	471671	14083	226010	48
AUG	275665	814410	2.95	5970	269695	796772	461601	20719	254946	55
SEP	243237	733168	3.01	710	242517	731027	449206	24112	219115	49
OCT	245532	736349	3.00	121	245411	735906	409257	26746	218706	45
NOV	258603	780413	3.02	250	258353	779658	479103	30021	220582	40
DEC	233068	705586	3.03	49	233019	705437	479109	23944	209124	44
TOTAL	3189661	9271410	2.91	17250	3172411	9220887	5701326	296617	2893044	51

FORT E TR

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFPF MAN-DAYS	CFPF FOOD COST	AUTHORISED MAN-DAYS	CASH, TRANS & MPV MAN-DAYS	EXCL CASH MAN-DAYS	PERCENT PARTIC
1977										
JAN	43830	122413	2.79	3877	39953	111584	70404	3961	39869	57
FEB	36507	104316	2.84	3895	32612	93186	60749	4241	32266	53
MAR	39903	112636	2.82	4252	35651	100633	65653	4647	35254	54
APR	36473	103450	2.84	4060	32413	91934	65650	5630	30843	47
MAY	39989	113402	2.84	4113	35876	101738	69633	5445	34544	50
JUN	40402	118567	2.91	4733	35949	104772	67904	5559	35123	52
JUL	35626	104230	2.93	3930	31694	92739	70600	5092	30534	43
AUG	43667	136611	3.13	4421	39246	122780	70920	5159	38508	54
SEP	42233	125277	2.97	4465	37768	112032	66872	3476	38757	58
OCT	43624	135558	3.11	3997	39627	123137	80000	4176	39448	49
NOV	40403	118647	2.93	3470	37013	108477	77120	3617	36866	48
DEC	30895	87980	2.85	2771	28124	80080	66298	2749	28146	42
TOTAL	473912	1383095	2.92	47984	425928	1243100	831781	53752	420160	51

VINT HILL FARMS

	TOTAL MAN-DAYS FED	TOTAL FOOD COST	FOOD COST PER RATION	NAT GUARD & RES MAN-DAYS	CFPF MAN-DAYS	CFPF FOOD COST	AUTHORISED MAN-DAYS	CASH, TRANS & MPV MAN-DAYS	EXCL CASH MAN-DAYS	PERCENT PARTIC
1977										
JAN	4974	11704	2.35	0	4974	11704	8174	606	4360	53
FEB	4468	12652	2.83	0	4468	12652	8112	594	3874	48
MAR	4045	14562	3.01	0	4845	14562	9369	724	4121	44
APR	4206	12126	2.83	0	4206	12126	8907	567	3719	41
MAY	3980	11824	2.97	0	3980	11824	8521	540	3440	40
JUN	4247	12220	2.88	0	4247	12220	8676	542	3705	43
JUL	0	0	1	0	0	0	0	0	0	1
AUG	3921	12319	3.14	0	3921	12319	7719	600	3313	43
SEP	3461	10020	2.90	0	3461	10020	7361	691	2770	38
OCT	2005	8777	3.13	0	2005	8777	6750	546	2259	33
NOV	3024	9460	3.13	0	3024	9460	6429	708	2316	36
DEC	2026	8446	2.99	0	2026	8446	6082	607	2139	31
TOTAL	42037	124110	2.90	0	42037	124110	86908	6813	36024	41

* INFORMATION NOT AVAILABLE

TABLE D.2

	# of DFs	Rations/Day
Fleet Combat Trng. Cntr. Damneck, Va.	1	444
AMPHI BASE, Little Creek, Va.	2	761
NAS, Norfolk, Va.	1	383
NAV SHIPYD, Portsmouth, Va.	1	320
COM STA, Norfolk, Va.	1	19
HDQ TRAS CINC LANT FLT, Norfolk, Va.	1	149
NAS Oceana, Va.	2	786
NAV WEAP STA, Yorktown, Va.	1	153
NAV STA, Norfolk, Va.	2	1219
Quantico (details provided for individual DFs)	1	550
	1	500
	1	350
	1	280
	1	100
	1	65
	1	34

TABLE D.3
FOOD COST PER RATION

1978 Month	Carson		Knox		Lewis	
	<u>MDF*</u>	<u>\$</u>	<u>MDF</u>	<u>\$</u>	<u>MDF</u>	<u>\$</u>
Jan	108,467	298,689	203,238	556,391	188,761	530,630
Feb	84,348	234,368	198,685	545,444	169,118	478,054
Mar	103,742	293,492	229,610	660,521	202,761	580,400
Apr	96,250	275,036	205,432	588,762	167,531	480,731
May	115,872	340,627	215,131	620,058	195,905	574,694
June	97,703	300,015	212,602	643,038	177,747	534,191
July	99,364	315,772	234,304	733,479	157,107	495,111
Aug	127,788	395,364	240,202	759,430	181,089	555,125
Sept	<u>86,732</u>	<u>280,672</u>	<u>208,944</u>	<u>664,511</u>	<u>151,520</u>	<u>469,210</u>
	920,266	2,734,035	1,948,148	5,771,634	1,591,539	4,698,196
Cost per Ration	2.970918191		2.962626043		2.951982955	
1977 Cost per Ration	2.872291701		2.913805239		2.949772698	
Percent increase	3.4337212		1.6754999		0.0749297	
Adjusted CFPF Food Costs	3,970,865		8,509,474		5,970,233	
Average Cost per ration for Fts. Carson, Knox, and Lewis						
Nine Months of 1978			2.960539046			
1977			2.916625714			
Percent increase			1.5056211			
Adjusted CFPF Food Costs for:						
Region I		16,418,471				
Region II		22,179,913				
Ft. Lee		2,224,644				

*MDF=Man Days Fed

TABLE D.4
SUMMARY OF FOOD COSTS AND SAVINGS

NOTE: Within each section lines 1-6 correspond to Ft. Lee, Ft. Carson, Ft. Lewis, Ft. Knox, Region I, and Region II respectively.

Conventional Food Cost	Food Cost Savings, %					
	10		15		20	
	CFPF Service, %		CFPF Service, %		CFPF Service, %	
	30	50	30	50	30	50
CFPF Food Cost						
2121644	2157905	2113412	2124536	2097796	2091166	2092190
3770659	3851739	3772321	3722176	3673059	3732613	3673773
5790233	5791127	5671722	5701573	5522466	5612920	5377210
8709474	8254190	8084091	8126548	7871264	7998906	7648527
15418471	15925917	15597548	15679640	15187086	15433363	14774624
22179913	21514516	21070918	21181817	20516420	20849119	19961922

Food Savings

2121644	66737	111252	100168	155848	133478	321469
3770659	117125	198543	178689	297814	238251	377096
5790233	179106	298511	268660	467767	358213	597023
8709474	235284	425473	382926	638210	510568	859977
15418471	472551	820923	736831	1231385	795198	1611111
22179913	665397	1108995	998096	1563493	1330794	2111111

Cost of Inventory

2121644	49368	82281	46626	77710	43388	75113
3770659	88120	146867	83224	138708	78332	130594
5790233	132490	220816	125127	208549	11774	19578
8709474	188840	314733	178349	297121	16785	27976
15418471	344355	607258	344113	57352	32387	53976
22179913	492211	820352	46486	77477	43752	75113

Cost of Carrying Inventory

2121644	4936	8228	4662	7771	4338	7511
3770659	8812	14686	8322	13870	7833	13059
5790233	13249	22081	12512	20854	11774	19578
8709474	18884	31473	17834	29712	16785	27976
15418471	34435	60725	34411	57352	32387	53976
22179913	49221	82035	46486	77477	43752	75113

Net Savings

2121644	61865	193064	95446	159077	129993	211111
3770659	119313	193857	170366	283944	230412	377096
5790233	165837	276150	266138	426913	342137	579023
8709474	236400	394000	365942	605485	493783	859977
15418471	456117	750194	704420	1171935	752721	1541847
22179913	616176	1026760	951810	1588018	1287092	2117991

E. SUPPLY COSTS

The supply costs are based on actual experience at the Ft. Lee CFPF during the period, March-July 1978. Using the data for this period and the information provided by Mr. R. Bustead (NARADCOM)-- see TABLE E.1-- two estimates of supply costs are obtained:

1. A high estimate that assumes the present Ft. Lee packaging procedures are followed; and,
2. A low estimate that assumes the packaging procedures of TABLE E.1 are followed.

The major cost items were reviewed with Mr. Brown (Ft. Lee) to obtain current costs of supplies so that an approximation of the portion of supply costs that are related to production rate or to the area of the CFPF facility could be obtained. This revealed that the dollar value of CFPF supplies is comprised of approximately:

- (1) 94% packaging materials that can be considered to vary in direct proportion to production rates; and,
- (2) 6% sanitation materials that can be considered to vary in direct proportion to the area of the CFPF facility.

The supply costs used in this analysis are summarized in TABLE E.2. These costs are based upon the following procedure.

1. Ft. Lee Experience

	<u>Actual (Mar-Aug'78)</u>	<u>Projected(Annual)</u>
IP and CK Supply Costs	\$ 38,013	75,406
TSO Supply Costs	2184	4332
No. of Meals in SDFs	1,055,707	2,094,201
CSL,%	28.38 (Apr-Aug, Mar not avail.)	

2. Supplies proportional to:

$$\text{Production} = (.94). (75,406) + 4332 = 75,214$$

$$\text{Area} = (.06). (75,406) = 4,524$$

Above assumes that all TSO supplies are proportional to production.

3. Formulas to estimate supply costs

a. High estimates

- i. Production related supplies for meals per year denoted by MPY and a given CSL

$$\begin{aligned} P \text{ SUPPLY } \$ &= \left(\frac{\text{MPY}}{2,094,201} \right) \cdot \left(\frac{\text{CSL}}{28.38} \right) \cdot (75,214) \\ &= (0.0012655) \cdot \text{MPY} \cdot \text{CSL} \end{aligned}$$

- ii. Area*related supplies for a CFPF Facility of A ft.²

$$\begin{aligned} A \text{ SUPPLY } \$ &= \left(\frac{A}{44,947} \right) \cdot (4524) \\ &= (0.10065)A \end{aligned}$$

b. Low estimates

Ft. Lee projected annual costs adjusted for use of lowest cost alternative =

$$\frac{(23,842)}{(51,290)} \cdot (70,882) + 4332 = 37,281$$

$$P \text{ SUPPLY } = \frac{(37,281)}{(75,214)} \cdot (0.0012655) \cdot (\text{MPY}) \cdot (\text{CSL})$$

$$= (.00062727) \cdot (\text{MPY}) \cdot (\text{CSL})$$

- ii. Area related supplies remain unchanged.

*Area of Ft. Lee CFPF=44,947 ft.²

TABLE E.1

FORT LEE PACKAGING COSTS*

	<u>NOW (S/SVG)</u>	<u>LOWEST COST ALT. (S/SVG)</u>	<u>OTHER ALT. (S/SVG)</u>
Soup	0.0029	0.0017 (Milk Cartons)	--
Pies	0.0158	0.0158 (Same)	--
Entrees	0.329	0.0075 (Mold & Film) 23%	0.0155 (Boil-in-bag) 47%
Vegetables	0.0186	0.0038 (Mold & Firm) 20%	--
Potato Cakes	0.0150	0.0150 (Same)	--
Cookies	0.0035	0.0046 (Sleeve Boxes) 131%	--
Cakes, Etc.	0.0196	0.0076 (Loaf Cake) 38%	0.0151 (Sleeve Box) 77%
TOTAL/MONTH	\$4274.21	\$1986.85	
TOTAL/YR	\$51,290	\$23,842 46%	

One month Food Cost \$23,509.54 (Packaging = 15% of food and packaging)

*Based on June 1978 production costs and packaging costs provided by FEL.

Total servings = 273,723 = 9291 servings/day

Ave cost/serving = \$0.0153/svg

TABLE E.2
SUMMARY OF CFPF RELATED SUPPLIES

	Area (1000 ft ²)	Area Related Supply Cost	Meals Per Year	Total Supply Costs		
				High Estimate 30% CSL	Low Estimate 30% CSL	50% CSL
Ft. Lee	40	4026	2281334	90639	148380	46957 75577
Ft. Carson	40	4026	3956936	154253	254404	78488 126130
Ft. Lewis	60	6039	5972099	232773	383929	118423 193346
Ft. Knox	60	6039	8535333	330087	546119	166659 273738
Region I	80	8052	16411079	631107	1046477	316879 522764
Region II	80	8052	22185353	850330	1411849	425540 703866

APPENDIX F
FREEZER REQUIREMENTS
for the REGIONAL ANALYSIS

F-I. TISA FREEZER SPACE

In the regional analysis, it is assumed that existing dry and chilled storage areas are adequate at all of the SBs. However, it is assumed that each SDF will require one freezer and that each SB will require additional TISA freezer space-- enough to hold a thirty day supply of frozen CFPF items.

The additional freezer space and the corresponding cost are approximated by formulas developed below. The development utilizes the data summarized in Table F.1.

TABLE F.1

	Dollar Value of		*
	Issues to SDFs	CFPF Production	No. of Boxes Used
	June-Aug 78	June 78	June 78
Entrees, CFPF	110,675	16,697	590
Desserts, CFPF	21,462	13,143	1371
Subtotal	132,137	29,840	1961
IP(non-frozen), CFPF	24,965	7,843	0
Total CFPF Issues	157,102	37,683	1961
Total Issues to SDFs	533,730		
CFPF Service Level	29.43		
Total Meals Served	519,079		

* Volume of box: (14" x 13" x 22") = 2.32 ft.³

F-I. A. Development of Volume Formula

Estimated volume required to support June-Aug Shipments:

$$\text{Entrees: } (110,675) \cdot \left(\frac{590}{16,697} \right) \cdot (2.32) = 9073.00 \text{ ft.}^3$$

$$\text{Desserts: } (21,462) \cdot \left(\frac{1371}{13,143} \right) \cdot (2.32) = 5193.99 \text{ ft.}^3$$

Total (29.43% CFPF Service and

519,079 meals)

14,266.99 ft.³

Procedure followed to estimate satellite TISA freezer requirements for 30 day supply of frozen CFPF products for:

% CFPF Service Level = CSL

Meals per year = MPY

$$Ft^3 = \left(\frac{CSL}{29.43} \right) \cdot \left(\frac{MPY}{519,079} \right) \left(\frac{30}{365} \right) \cdot \left(\frac{14,256.99}{0.52} \right)$$

* Space utilization is taken as 62% per the Military Transportation Rates Manual.

If we denote this volume as $V(30)$, we have:

$$V(30) = (123807) \cdot (10)^{-9} \cdot MPY \cdot CSL; \text{ and,}$$

$$V(N) = V(30) \cdot (N/30) \text{ where } N \text{ is an arbitrary number of days.}$$

F-I 8. Development of Cost Formula

The cost of freezer space is based on the walk-in freezer in the Ft. Lee CFPF as follows:

Installed cost \$21,148

Cost scaled for inflation

$$(6\%, 6 \text{ years}) = (1.06)^6 (21,148) = \$29,998.84$$

Volume = (25'x39'x7') 6825

Cost per cubic ft. \$4,3954

$$\begin{aligned} \text{Cost of satellite freezer} &= (1.06)^6 (21,148) V(30) / (6825) \\ &= (5441858) (10)^{-10} \cdot MPY \cdot CSL \end{aligned}$$

The volume requirements and the capital cost of freezers for the SBs considered in the regional analysis are summarized in TABLE F.2. Four of the SBs have volume requirements that are in the range of the freezers installed in each of the DFs; consequently, an additional charge for freezers was not made.

F-II. SDF Freezers

Sizing freezers by SDF is not attempted. It is assumed that a freezer comparable to the ones installed at Ft. Lee will be used. The costs of these freezers are taken as the average installed cost of the 14 freezers at Ft. Lee scaled for inflation (1 year, 6%); this yields a cost of \$5321.5 per freezer.

TABLE F.2
SUMMARY OF FREEZER REQUIREMENTS FOR REGIONAL ANALYSIS

SAs Served by Ft. Lee, CFPF CSL, %	Annual Number of Rations	Meals	Space Requirements 30	TISA Freezer Requirements 50	Capital Cost 30	50	Number of DFs	Cost of DF Freezers
Region I:								
1. Ft. Bragg	3,172,411	9,368,676	34,797	57,995	152,949	254,915	63	335,255
2. Ft. Belvoir	425,928	1,257,839	4,672	7,786	20,535	34,225	5	26,608
Ft. Myer	359,444	1,061,500	3,943	6,571	17,330	28,883	3	15,965
Vint Hill Farms	46,921	138,566		--	--	--	1	5,322
Ft. Meade	229,046	676,412	2,512	4,187	11,043	18,405	5	26,608
Totals for (2)	1,061,339	3,134,317	11,127	18,544	48,908	81,513	14	71,501
3. Ft. Eustis	550,849	1,625,752	6,042	10,070	26,558	44,263	10	53,215
Totals for Region I	4,784,599	14,129,745	51,966	86,609	228,415	380,691	87	462,971
Region II:								
1. Ft. Bragg	3,172,411	9,368,676	34,797	57,995	152,949	254,915	63	335,255
2. Ft. Belvoir	425,928	1,257,839	4,672	7,786	20,535	34,225	5	26,608
Ft. Myer	359,444	1,061,500	3,943	6,571	17,330	28,883	3	15,965
Totals for (2)	785,372	2,319,339	8,615	14,357	37,865	63,108	8	42,572
3. Quantico MB	685,835	2,025,389	7,523	12,538	33,066	55,109	7	37,251
Totals for (2) & (3)	1,471,207	4,344,728	16,138	26,895	70,931	118,217	15	79,823
4. Ft. Eustis	550,849	1,626,752	6,042	10,070	26,558	44,263	10	53,215
FLT COMB TNG CTR	162,060	478,591	1,778	2,963	7,813	13,022	1	5,322
AMPHI BASE	277,765	820,288	3,047	5,078	13,392	22,319	2	10,643
MAS NORFOLK	139,795	412,839	1,533	2,556	6,740	11,233	1	5,322
NAV SHIPYD	116,800	344,931	1,281	2,135	5,631	9,385	1	5,322
COM STA	6,935	20,480	76	127	--	--	1	5,322
HQX TRANS CINC	54,385	160,608	597	994	--	--	1	5,322
LANT FLT								
MAS OCEANA	286,890	847,236	3,147	5,245	13,832	23,053	2	10,643
NAV WEAP STA	55,845	164,920	613	1,021	--	--	1	5,322
NAV STA	444,935	1,313,970	4,880	8,134	21,451	35,752	2	10,643
Totals for (4)	2,096,259	6,190,615	22,994	38,323	95,417	159,027	22	117,073
Totals for Region II	6,739,877	19,904,019	73,929	123,213	319,297	532,159	100	532,150

APPENDIX G

TRANSPORTATION FOR REGIONAL ANALYSIS

G-I. GENERAL BACKGROUND

It is assumed that shipments of frozen CFPF products can be made by either rail or truck and that the least costly alternative will be used; these shipments are made as required but no less than once per month. All chilled (IP) shipments are assumed to be made by truck and are made no less frequently than twice per week.

The relationship between volume and weight are based upon the Uniform Ration Cost System and the Vietnam 28 day menu. This information was provided by Mr. R. Bustead (NARADCOM). The resulting weight and volume relationships are:

- (a) 3,373 pounds of frozen food requires 94.5 ft.³; and,
- (b) 10,525 pounds of chilled food requires 274 ft.³.

These relationships are used in conjunction with the volume of frozen food (determined in APPENDIX F) and the volume of chilled food (developed below) to determine annual shipping requirements and costs.

The basic transportation rates were provided by the Military Traffic Management Command, Bayonne, New Jersey. These rates are summarized in TABLE G.1.

The mileage for the routes used in this analysis are based upon TABLE G.2.

It is assumed that refrigerated trailers and railroad cars are 8 feet high and 8 feet wide in order to determine both a gross volume and a useable volume for products; the latter volume is taken as 62% of the gross volume. The resulting volumes and weights of frozen and chilled products are summarized in TABLE G.3. Note that the useable

TABLE G.1
TRANSPORTATION RATES

Provided by Military Traffic Management Command, Bayonne, N.J.

From Ft. Lee, Va., to:	Rail Shipments*			Refer. Truck Shipments						
	Cost per 100 lbs., \$	Minimum Weight, 1000 lbs	Maximum Length (ft.) of RR car	Cost per 100 lbs., \$	Weight Charged, 1,000 lbs.	Cost Per Truck Shipment, \$				
Ft. Bragg, N.C.	0.97	55	--	1.17	30	351				
	0.91	65	--	1.10	34	374				
	0.86	75	--	34,000 lbs. is maximum weight allowed						
	Add \$198.72 per car for refrigeration									
Norfolk, Va.	1.54	23	--	1.07	24	256.80				
	1.25	30	--	.95	30	285				
	1.14	35	--	.84	40	336				
	1.09	45	53	40,000 lbs. is maximum weight allowed						
	+ \$0.62 for ea. 100 lbs. over 45,000 lbs.									
	+ \$0.62 for ea. 100 lbs. over 55,000 lbs.									
Bolling AFB, Washington, D.C.	Add \$161.92 per car for refrigeration									
	1.91	23	--	2.11	24	506.40				
	1.56	30	--	2.09	30	627				
	1.42	35	--	30,000 lbs. is maximum weight allowed						
	1.19	45	53							
	+ \$0.77 for ea. 100 lbs. over 45,000 lbs.									
1.19						55	60			
+ \$0.77 for ea. 100 lbs. over 55,000 lbs.										
Add \$161.92 per car for refrigeration										
*No maximum weight specified.										

*No maximum weight specified.

TABLE G.2
MILEAGE CHART FOR REGIONAL ANALYSIS*

Distances in Miles:

From/To	Ft. Lee	Ft. Eustis	Ft. Belvoir	Ft. Myer	Ft. Bragg	Vint Hill Farms**	Ft. Meade	Bolling AFB	Quantico Mar. Base*	Naval Stations**
Ft. Lee		83	111	125	200	136	153	124	85	100
Ft. Eustis			144	158	271		181	157		20
Ft. Belvoir				16	307		42	13	30	
Ft. Myer					321		31	8		
Ft. Bragg							349	320		
Vint Hill Farms										
Ft. Meade								29		

*The mileage in this chart is taken as the standard allowed for travel on U.S. Government business except for columns marked with **.

**These distances were estimated from a Rand McNally Road Atlas. Further, nine naval bases in the Norfolk area are considered as a group with the nominal distances from Ft. Lee and Ft. Eustis taken as 100 and 20 miles respectively.

TABLE G.3

<u>Shipping Unit</u>	<u>Volume of Shipping Unit, ft.³</u>		<u>Weight in Lbs. Corresponding to Useable Volume for:</u>	
	<u>Gross</u>	<u>Useable</u>	<u>Frozen Product</u>	<u>Chilled Product</u>
53' railroad car	3392	2103.04	75,064	80,783
60' railroad car	3840	2380.8	84,978	91,452
40' refrigerated trailer	2560	1587.2	56,652*	60,968*
30' refrigerated trailer	1920	1190.4	42,489*	45,726*
20' refrigerated trailer	1280	793.6	28,326	30,484**

*Above maximum legal weights for all areas

**Above maximum legal weight for Washington, D.C.

volume of the 30 and 40 foot trucks will hold more weight of CFPF products than the legal limits allow. Consequently, weight is used to determine the number of shipments required when this occurs.

G.II. WEIGHT AND VOLUME REQUIREMENTS

A. Frozen CFPF Products

The freezer volume required to hold a 30 day supply of frozen CFPF products was determined in APPENDIX F; this volume was denoted as V(30). Using V(30) we determine the annual volume and weights of frozen products as follows:

$$\text{Annual Volume of Frozen Product (AVFP)} = (365)V(30)/[(0.62)(30)]$$

$$\text{Annual Weight of Frozen Product (AWFP)} = (3,373)AVFP/(94.5)$$

These requirements along with the shipping mode, number of shipments per year, and costs are summarized in TABLE G.4. The determination of the shipping mode, number of shipments and costs are explained under G.III.

B. Chilled CFPF Products

Space requirements for chilled shipments are based upon information supplied by MFR, 27 September 1978, R. Bustead; a summary follows:

Ft. Lee IP requirements for one week, CSL = 31.99%, 5,581 meals per day:

392 pans, 8 per 14" x 13" x 22" box	113.54 ft. ³
381 10" x 24" bags, 1 per 7" x 7" x 11" box	118.84 ft. ³
59 18" x 24" bags, 1 per 12" x 12" x 10" box	<u>49.17 ft.³</u>
Total chilled volume	281.55 ft. ³

TABLE G.4
SUMMARY OF WEIGHT, VOLUME AND SHIPPING REQUIREMENTS FOR FROZEN PRODUCTS

SBs Served by Ft. Lee, CPFF CSL, S=	Annual Number of Rations	Meals	Volume, Ft. 3		Weight, Lb.		Annual Requirements		Shipping Requirements		Cost
			30	50	30	50	Shipment Unit	No. Trips	Cost	No. Trips	
Region I:											
1. Ft. Bragg	3,172,411	9,368,676	262,487	437,479	9,368,987	15,614,979	60' RR Car	110.3	102,527	183.8	170,848
2. Ft. Belvoir	425,928	1,257,839	35,241	58,736	1,257,881	2,096,468	60' RR Car	14.8	15,499	24.7	25,867
Ft. Myer	359,444	1,061,500	29,741	49,568	1,061,535	1,769,225	60' RR Car	12.5	13,091	20.8	21,783
Vint Hill Farms	46,921	138,566	3,882	6,470	138,571	230,951	24K Lb. Trailer	12	4,191	12	4,191
Ft. Meade	229,046	676,412	18,951	31,586	676,434	1,127,391	53'60" RR Car	12(53')	9,420	13.3(60')	13,928
Totals for (2)	1,061,339	3,134,317	87,815	146,360	3,134,421	5,224,035					
3. Ft. Eustis	550,849	1,626,752	45,578	75,963	1,626,806	2,711,343	40K Lb. Trailer	40.7	13,675	67.8	22,781
Totals for Region I	4,784,599	14,129,745	395,880	659,802	14,130,214	23,550,357			158,403		259,398
Region II:											
1. Ft. Bragg	3,172,411	9,368,676	262,487	437,479	9,368,987	15,614,979	60' RR Car	110.3	102,527	183.8	170,848
2. Ft. Belvoir	425,928	1,257,839	35,241	58,736	1,257,881	2,096,468	60' RR Car	14.8	15,499	24.7	25,867
Ft. Myer	359,444	1,061,500	29,741	49,568	1,061,535	1,769,225	60' RR Car	12.5	13,091	20.8	21,783
Totals for (2)	785,372	2,319,339	64,982	108,304	2,319,416	3,865,693					
3. Quantico MD	685,835	2,025,389	56,746	94,577	2,025,456	3,375,760	40K Lb. Trailer	50.7	17,035	84.4	28,358
Totals for (2) & (3)	1,471,207	4,344,728	121,728	202,881	4,344,872	7,241,453					
4. Ft. Eustis	550,849	1,626,752	45,578	75,963	1,626,806	2,711,343	40K Lb. Trailer	40.7	13,675	67.8	22,781
FLT COMB ING CTR	162,060	478,591	13,409	22,348	478,607	797,678	40K Lb. Trailer	12	4,032	20	6,720
AMPHI BASE	277,765	820,286	22,982	38,304	820,315	1,367,192	40K Lb. Trailer	20.5	6,888	34.2	11,491
MAS MORON K	139,795	412,839	11,567	19,278	412,853	688,088	(1) 40K Lb. Trailer	14.5	4,872	24.1	8,098
NAV SHIPYD	116,800	344,931	9,664	16,107	344,942	574,904	(2) 40K Lb. Trailer	13.2	4,435	22	7,392
CUM STA	6,935	20,480	574	956	20,481	34,134	Included with (2)				
HWY TRANS CINC	54,385	160,608	4,500	7,500	160,613	267,689	Included with (2)				
LANT FLI	286,890	847,236	23,737	39,562	847,264	1,412,107	40K Lb. Trailer	21.2	7,123	35.3	11,061
MAS OCEANA	55,845	164,920	4,621	7,701	164,925	274,876	Included with (1)	21.1	7,123	35.2	11,861
NAV WEAP STA	444,935	1,313,970	36,814	61,357	1,314,014	2,190,023	40K Lb. Trailer	32.9	11,054	54.8	18,413
Totals for (4)	2,096,259	6,190,615	173,446	289,076	6,190,820	10,318,034			200,231		333,612
Totals for Region II	6,739,877	19,904,019	557,661	929,436	19,904,679	33,174,466					

This information is used to determine the annual volume (AVCP) and weight (AWCP) requirements as follows:

$$AVCP = (MPY) \cdot \{ (281.55) / [(7) \cdot (5581)] \} \cdot (CSL) / (31.99)$$

$$AWCP = AVCP \cdot (10,525) / (274)$$

Since chilled shipments are assumed to be made at least twice a week, the volume and weight requirements per shipment (denoted by SVCP and SWCP respectively) are given by:

$$SVCP = (AVCP / 365) \cdot (3.5)$$

$$SWCP = (AWCP / 365) \cdot (3.5)$$

The resulting requirements are summarized in TABLE G.5.

G-III. SHIPPING COSTS

The transportation rates used in this analysis, as mentioned before, are summarized in TABLE G.1. Since rates were provided for only three locations, the following assumptions are made:

1. The rates provided for shipments to Norfolk, Va. are used for all SBs in that area and for Quantico Marine Base. Quantico is in Virginia and closer to Ft. Lee than all SBs in the Norfolk area except for Ft. Eustis.
2. The truck rate to Vint Hill Farms is determined from the rate to Norfolk scaled to the mileage from Ft. Lee to Vint Hill Farms; i.e.,

Rate from Ft. Lee to Vint Hill Farms =

$$\frac{(136)(\text{Rate to Norfolk, Va.})}{100}$$

This is \$349.25 for the minimum weight of 24,000 pounds.

3. The truck and rail rates for shipments to Bolling AFB, Washington, D.C. are used for all SBs in the D.C. area.
4. In the case of chilled shipments, multiple SBs are contained on a single route. The cost of these routes are scaled to the mileage traveled based on the rate given for the appropriate city. These routes are discussed under G.III.B.

A. Cost of Frozen Product Shipments

All frozen product shipments are made by the least costly shipping alternative; this is indicated in TABLE G.4 under the column labeled shipping unit. The best alternative for all SBs within Virginia is by truck; indicated by 24K Lb. Trailer for Vint Hill Farms and 40K Lb. Trailer for all other Virginia SBs. The best alternative for all other SBs is by railroad car; indicated by 53'/60' RR car for Ft. Meade and by 60' RR car for all other SBs outside of Virginia. The 53'/60' for Ft. Meade indicates that a 53' RR car is used at a CSL of 30% and that a 60' RR car is used at a CSL of 50%.

In Region II it is assumed that shipments are combined for the two groups listed below; this insures full truck load shipments for Region II SBs.

(1) NAS NORFOLK and NAV WEAP STA

(2) NAV SHPYD, COM STA, and HDQ TRANS CINC FLT.

In Region I: Vint Hill Farms requires less than 24,000 pounds of frozen product at both CSLs; consequently, it is charged for twelve shipments at the minimum rate. At CSL=30%, Ft. Meade requires about 56,370 pounds

per month of frozen product (less than a 53 foot railroad car); it is charged for twelve shipments at this weight, which is the least costly alternative. All other shipments are in essentially full trailer or railroad car quantities (FLT COMB TNG CTR averages 39,884 lbs./trailer--all others are full).

The number of full trips per year is obtained by dividing the AWP by the weight capacity of the shipping unit (see TABLE G.3 for railroad cars); the result is rounded up in the tenths position. Fractional trips are assumed since the remainder of the shipping unit will satisfy some of the requirements in the following year. The resulting number of trips and the corresponding costs are summarized in TABLE G.4.

B. Cost of Chilled Product Shipments

All chilled product shipments are assumed to be made by truck in order to shorten the delivery time. Further, the following routes are assumed (see TABLE G.5 for volume and weight requirements per trip):

Route 1, same for both Region I and Region II: Ft. Lee, Va. to Ft. Bragg, N.C.

CSL=30% requires 607 ft.³ and 23,323 lbs. per trip.

(365/3.5) trips per year at \$351.00/trip=\$36,604

CSL=50% requires 1012 ft.³ and 38,871 lbs. per 3½ days which

is above the legal weight limit. In this case, it is assumed that shipments are made every three days and require 867 ft.³ and 33,318 lbs. per trip.

(365/3) trips per year at \$374/trip=\$45,503

Route 2, Region I: Ft. Lee, Va. to Ft. Belvoir to Ft. Myer
to Ft. Meade, 158 miles (see TABLE G.2).

CSL=30% requires 204 ft.³ and 7,803 lbs.

CSL=50% requires 339 ft.³ and 13,004 lbs.

The number of trips and cost per trip are the same for both CSLs:

(365/3.5) trips per year at $(\frac{158}{124})(506.40)/\text{trip} = \$67,291$

NOTE: Cost per trip scaled for mileage based upon Washington, D.C. rate.
Also, it is assumed that Vint Hill Farms picks up its IP products from
either Ft. Belvoir or Ft. Myer.

Route 2, Region II: Ft. Lee to Quantico MB to Ft. Belvoir to
Ft. Myer, 131 miles

CSL=30% requires 282 ft.³ and 10,816 lbs.

CSL=50% requires 470 ft.³ and 18,026 lbs.

Both CSLs use minimum charge trips:

(365/3.5) trips per year at $(\frac{131}{124})(506.40)/\text{trip} = \$55,792$

Route 3, Region I: Ft. Lee to Ft. Eustis

CSL=30% requires 105 ft.³ and 4,050 lbs.

CSL=50% requires 176 ft.³ and 6,749 lbs.

Both CSLs use minimum charge trips:

(365/3.5) trips per year at 256.8/trip = \$26,781

Route 3, Region II: Ft. Lee to Ft. Eustis and all Naval SBs in the
Norfolk area, 173 miles---assumes 83 miles to Ft. Eustis and 10
miles between each SB

CSL=30% requires 400 ft.³ and 15,412 lbs.

(365/3.5) trips per year at $(\frac{173}{100})(256.80)/\text{trip}=\$46,330$

CSL=50% requires 670 ft.³ and 25,684 lbs.

(365/3.5) trips per year at $(\frac{173}{100})(285)/\text{trip}=\$51,418$

The total transportation costs are summarized in TABLE G.6.

TABLE G.6
SUMMARY OF TRANSPORTATION COSTS

	CSL=30%	CSL=50%
Region I:		
Frozen Shipments	158,403	259,398
Chilled Shipments		
Route 1	36,604	45,503
Route 2	67,291	67,291
Route 3	26,781	26,781
Total Cost of Chilled Shipments	130,676	139,575
Total Transportation Costs	289,079	398,973
Region II:		
Frozen Shipments	200,231	333,612
Chilled Shipments		
Route 1	36,604	45,503
Route 2	55,792	55,792
Route 3	46,330	51,418
Total Cost of Chilled Shipments	138,726	152,713
Total Transportation Costs	338,957	486,325

H-I. CAPITAL COSTS FOR THE CFPF FACILITIES

The capital costs for these three CFPF facilities are determined as follows:

1. Equipment cost and area of the three CFPFs were provided by Mr. G. Hudson (TSA, Ft. Lee), telephone conversation 4 October 1978,
2. Mr. J.K. Prifti (FEL, NARADCOM) supplied the costs for CFPF buildings with areas of:
 - (a) 66,817 ft.² (DRDNA-WS, MFR, 6 July 1978) and
 - (b) 47,188 ft.² (DRDNA-WS, MFR, 8 September 1978).
3. The procedure used by Mr. Prifti in determining the cost of the two facilities covered in his MFR's cited in (2) is: used to obtain the costs of buildings with 40, 60 and 80 thousand square feet as follows:

Concept design of the CFPF, Ft. Benning, GA, as prepared by Wise, Simpson, Aiken Associates, 1974.

Area	79,465 ft. ²
Cost	\$4,096,321

New Base Cost 1974 = (Area of CFPF/79,465) . (\$4,096,321)

The Base Cost 1974 is increased by 25% for escalation; this result increased by 10% for contingency; and the final result is obtained following an additional 5% increase for S&A.

The resulting new costs are summarized below.

	Proposed CFPF Building Areas, Ft ²		
	40,000	60,000	80,000
Fraction of Original Area	<u>0.5034</u>	<u>0.7550</u>	<u>1.0067</u>
Base Building Cost (1974)	2,061,950	3,092,925	4,123,900
Escalation (25%)	515,487	773,231	1,030,975

	Proposed CFPF Building Areas, Ft ²		
	40,000	60,000	80,000
Contingency	<u>257,744</u>	<u>386,616</u>	<u>515,487</u>
S&A	141,759	212,639	283,518
Estimated Cost	2,976,940	4,465,410	5,953,880
Equipment Cost	3,549,100	3,943,400	4,337,700
Total Capital Expenditures	6,526,040	8,408,810	10,291,580
Maximum Capacity*,			
Meals per day	15,000	35,000	60,000

* Assumes a one shift operation

H-II CAPITAL COSTS for SDF FREEZERS

It is assumed that a freezer to store frozen CFPF products will be installed in each SDF. The installed cost of these freezers is assumed to be the average cost of the 14 freezers installed at Ft. Lee scaled for inflation (1 year at 6% per year); the resulting cost is \$5321.5 per freezer. The Ft. Lee freezers were mixed in size and in the location of the installation (inside of the building or outside). Consequently, the average cost should suffice for the current study.

H-III. OTHER CAPITAL COSTS

In the regional analysis additional capital costs are incurred for additional freezer space for SB TISAs (See APPENDIX F).

The capital expenditures and the resulting CRC are summarized in TABLE H.1. The following guide lines from the DOD ECONOMIC ANALYSIS HANDBOOK are used:

Item	Economic Life, years
Buildings	25
Equipment	10

Interest Rate = 10%

TABLE H.1
SUMMARY OF CAPITAL EXPENDITURES AND CRC

	Ft. Lee	Ft. Carson	Ft. Lewis	Ft. Knox	Region	Region II
Area of CFPF, ft. ²	40,000	40,000	60,000	60,000	80,000	80,000
No. of DFs	8	24	38	53	95	108
Meals/Year	2,281,334	3,956,936	5,972,099	8,535,333	16,411,079	22,185,353
Meals/Day	6,250	10,841	16,362	23,384	44,962	60,782
Capital Expenditures:						
Buildings	2,976,940	2,976,940	4,465,410	4,465,410	6,953,880	5,953,880
CFPF Equipment	3,549,100	3,549,100	3,943,400	3,943,400	4,337,700	4,337,700
SDF Freezers	42,572	127,716	202,217	282,040	505,543	574,722
Total Buildings	2,976,940	2,976,940	4,465,410	4,465,410	5,953,880	5,953,880
Subtotal Equipment	3,591,672	3,676,816	4,145,617	4,225,440	4,843,243	4,912,422
CRC: Total Buildings	327,964	327,964	491,946	491,946	655,927	655,927
CSL, %	na	na	na	na	30	30
Capital Expenditures:						
TISA Freezers	na	na	na	na	380,691	532,159
Total Equipment	3,591,672	3,676,816	4,145,617	4,225,440	5,231,719	5,444,581
Total	6,568,612	6,653,752	8,611,027	8,690,850	11,177,814	11,398,461
CRC: Total Equipment	584,528	598,385	674,680	687,671	851,438	886,080
Total	912,492	926,349	1,166,626	1,179,617	1,507,365	1,542,007

The CRC factor is computed from the equation:

$$\text{CRC factor} = \frac{(1+i)^n \cdot i}{(1+i)^n - 1}$$

This is approximately:

0.16275 for $i = .1$ and $n = 10$; and

0.11017 for $i = .1$ and $n = 25$

APPENDIX I

UTILITY COSTS

I-I UTILITY COSTS

Since the energy study of the CFPP at Ft. Lee is not completed, the costs used in this economic analysis have to be estimated in a very gross way. The estimates are based on:

1. A cost distribution formula that is used at each of the four military posts plus
2. An added energy charge based upon a procedure given by M.E.

McCormack (DALO-TAE, Memorandum for Record, 18 July 1978).

The distribution portion is combined with a similar charge for maintenance and repair and is discussed in section I-III. A summary of McCormack's procedure as it applies to the current study follows:

<u>Operation</u>	<u>BTU/lb.</u>
Cook: raise from 40°F to 160°F	96
Freeze: lower from 160°F to 0°F and remove latent heat of fusion (LHF)	260
Hold in freezer: Maintain 0°F for an average of 15 days	225
Reheat, raise from 0°F to 160°F and add LHF	<u>260</u>
Total	841
Less energy to cook from scratch	96
Net energy due to CFPP operation (100% Efficiency)	<u>745</u>
Net energy due to CFPP operation at 25% efficiency	2980 BTU/lb.
Using 3415 BTUs per KWH and a 25% efficiency, the energy requirements are	2980/3415 KWH/lb.

The above assumptions and the weight of frozen products as developed in APPENDIX G are used to obtain the energy costs summarized below.

SUMMARY OF ENERGY COSTS

Fort	Meals/Year	\$/KWH	CSL=30%		CSL=50%	
			Lbs. of Frozen Prod.	Cost	Lbs. of Frozen Prod.	Cost
Lee	2,281,334	0.028	2,281,410	55,743	3,802,350	92,904
Carson	3,956,936	0.024	3,957,067	82,872	6,595,112	138,121
Lewis	5,972,099	0.00612	5,972,297	31,895	9,953,829	53,158
Knox	8,535,333	0.023928	8,535,617	178,224	14,226,027	297,040
Region I	16,411,079	0.028	16,411,624	400,991	27,352,707	668,319
Region II	22,185,353	0.028	22,186,090	542,081	36,976,816	903,469

I-II. REPAIR PARTS

The cost for repair parts is based on Ft. Lee costs for the period 25 January-24 September 1978 scaled to the appropriate size as follows:

Cost of parts \$27,603* \$27,603*

Scaled to annual costs ($\$27,603 \times 1.5$) \$41,405

The \$41,405 is assumed to be adequate for the small (40,000 ft.²) CFPP and that the part costs for the larger facilities will be proportional to the capital expenditures for equipment. These costs are summarized as follows:

<u>Area of Facility, Ft²</u>	<u>Equipment Cost,\$</u>	<u>M&R Parts,\$</u>
40,000	3,549,100	41,405
60,000	3,943,400	46,005
80,000	4,337,700	50,604

*per MFR, DALO-TAE-D, 30 August 1978 and telephone conversation Mrs. J. Brown, 4 October 1978.

I-III. DISTRIBUTION COSTS for UTILITIES, MAINTENANCE and REPAIR

Each of the four Forts utilizes a cost distribution formula to assign part or all of the utility and maintenance and repair costs to a functional area. These are treated as follows:

- Ft. Lee uses a single rate of \$1.38/ft² year to cover both utilities and M&R
- Ft. Knox uses a rate of \$0.395/ft² year for utilities and rates listed below for M&R, all in \$/ft² year

o Administration	0.981
o DFs	0.675
o TISA	0.406

Weighting these rates by the approximate areas of the CFPF which correspond to these functional categories we obtain a rate of \$0.623/ft² year for M&R and a combined rate of \$1.018/ft² year.

-Ft. Lewis provided rates for M&R as follows, all in \$/ft² year

o Administration	0.142
o DFs	0.257
o TISA, cold	0.439
o TISA, dry	0.086

We were informed that the rate for DFs was actually a lower bound on the cost and it should not be used as a reasonable figure. The TISA rate for M&R at Lewis is used in our analysis. A distribution rate for utilities was not provided. By comparing costs of electricity and fuel at Ft. Lewis, Ft. Knox and Ft. Carson, this rate was estimated to be \$0.35/ft²-year. The combined rate is \$0.789/ft²-year.

- Ft. Carson uses \$0.54/ft²-year for utilities. A

CITA analysis of the M & R costs was in process during our visit and a distribution cost for this area was not provided. The data available from the CITA analysis for TISA produced a cost of \$0.44/ ft²-year and is used herein; the combined rate becomes \$0.98/ft²-year.

The total cost of utilities and M & R are summarized in TABLE I.1.

TABLE I.1

	LEE	CARSON	LEWIS	KNOX	REGION I	REGION II
CFPF area (1000 ft ²)	40	40	60	60	80	80
Distribution rate (\$/ft ²)	1.38	0.98	0.789	1.018	1.38	1.38
Util, M & R Distribution Cost	55200	39200	47340	61080	110400	110400
Cost of Parts	41405	41405	46005	46005	50604	50604
Subtotal	96605	80605	93345	107085	161004	161004
Energy for	30	82872	31895	178224	400991	542081
Food Processing	50	138121	53158	297040	668319	903469
	30	163477	125240	285309	561995	703085
Total	50	218726	146503	404125	829323	1064473

APPENDIX J
SUMMARY OF LOSSES (SAVINGS)
BY MODULE

The detailed costs and/or savings developed in Appendices A through I are summarized in TABLE J.1 for a CSL of 30% and in TABLE J.2 for a CSL of 50%.

TABLE J.1 (1 of 2)

SUMMARY OF COSTS & SAVING MODULE IN DOLLARS, CSL=30%

Military Post	Supply Costs	Food Savings	Capital	CFPF Staffing	Savings in SDF Staffing	Utilities M&R	Transportation	Supplies	Food Savings	Net Loss (Savings)
	10	10	912,492	709,492	468,808	152,348	--	90,639	61,803	1,334,360
	15	15					--		95,446	1,300,717
	20	20					--		129,090	1,267,073
Ft. Lee MPD=6250	10	10					--	46,957		1,290,678
	15	15					--			1,257,035
	20	20					--			1,223,391
	10	10	926,349	835,933	710,921	163,477	--	154,253	110,313	1,258,778
	15	15					--		170,366	1,198,725
	20	20					--		230,419	1,138,672
Ft. Carson MPD=10,841	10	10					--	78,488		1,183,013
	15	15					--			1,122,960
	20	20					--			1,062,907
	10	10	1,166,626	1,170,717	1,054,735	125,240	--	232,773	165,857	1,474,764
	15	15					--		256,148	1,384,473
	20	20					--		346,437	1,294,184
Ft. Lewis MPD=16,362	10	10					--	118,423		1,360,414
	15	15					--			1,270,123
	20	20					--			1,179,834

TABLE J.1 (2 of 2)

[illegible]

TABLE J.2 (1 of 2)

SUMMARY OF COSTS & SAVINGS BY MODULE IN DOLLARS, CSL=50%

Military Post	Supply Costs	Food Savings	Capital	CFPF Staffing	Savings in SDF Staffing	Utilities M&R	Transportation	Supplies	Food Savings	Net Loss (Savings)
Ft. Lee MPD=6250	10		912,492	918,339	523,279	189,509	--	148,380	103,004	1,542,437
	15	High					--		159,077	1,486,364
	20						--		215,151	1,430,290
Ft. Carson MPD=10,841	10						--	75,577		1,469,634
	15	Low					--			1,413,561
	20						--			1,357,487
Ft. Carson MPD=10,841	10		926,349	1,011,178	823,880	218,726	--	254,404	183,857	1,402,920
	15	High					--		283,944	1,302,833
	20						--		384,032	1,202,745
Ft. Carson MPD=10,841	10						--	128,130		1,276,646
	15	Low					--			1,176,559
	20						--			1,076,471
Ft. Lewis MPD=16,362	10		1,166,626	1,387,231	1,129,872	146,503	--	383,929	276,430	1,677,987
	15	High					--		426,913	1,527,504
	20						--		577,395	1,377,022
Ft. Lewis MPD=16,362	10						--	193,346		1,487,404
	15	Low					--			1,336,921
	20						--			1,186,439

TABLE J.2 (2 of 2)

Military Post	Supply Costs	% Food Savings	Capital	CFPF Staffing	Savings in SDF Staffing	Utilities M&R	Trans- portation	Supplies	Food Savings	Net Loss (Savings)
Ft. Knox MPD=23,384		10	1,179,617	1,675,262	1,544,394	404,125	--	546,119	394,000	1,866,729
	High	15					--		608,486	1,652,243
		20					--		822,971	1,437,758
A- 138		10					--	273,738		1,594,348
	Low	15					--			1,379,862
		20					--			1,165,377
Region I MPD=44,962		10	1,506,098	2,392,678	3,776,131	829,323	398,973	1,046,477	760,198	1,637,220
	High	15							1,174,033	1,223,385
		20							1,587,869	809,549
		10						522,764		1,113,507
	Low	15								699,672
		20								285,836
Region II MPD=60,782		10	1,542,007	2,674,395	5,305,941	1,064,473	486,325	1,411,849	1,026,960	846,148
	High	15							1,586,016	287,092
		20							2,145,071	(271,963)
		10						703,866		138,165
	Low	15								(420,891)
		20								(979,946)

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ANNEX B

WORK MEASUREMENT EVALUATION

OPERATION RESEARCH/SYSTEM

ANALYSIS OFFICE

NARADCOM

WORK MEASUREMENT EVALUATION
OF FORT LEE CFPS OPERATIONS

Operations Research and Systems Analysis Office
US Army Natick Research and Development Command

October 1978

AD-A067 929

TROOP SUPPORT AGENCY (ARMY) FORT LEE VA
CENTRAL FOOD PREPARATION SYSTEM. (U)
DEC 78

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SECTION I

EXECUTIVE SUMMARY

This evaluation was conducted to assess the labor requirements for operating a Central Food Preparation System (CFPS) in terms of personnel utilization, manpower and staffing. The specific objectives were to measure personnel performance; derive estimates of manpower requirements; determine the variations in workload for the different jobs; establish the work content of each job for defining skill levels and training requirements; and, to provide inputs to the economic analyses.

The approach to accomplishing these objectives was based on work sampling procedures. Data was collected in the Satellite Dining Facilities (SDF); the Central Food Preparation Activity (CFPA), which included the Central Food Preparation Facility (CFPF) and Ingredient Preparation Activity (IPA); and, in the warehousing and transportation sections of the Troop Issue Support Activity. All other elements of the CFPS in which the workloads were essentially unaffected by the level of operations were specifically excluded from consideration.

The time and resources available did not allow for a complete, detailed analysis of each and every satellite dining facility. Instead, the available facilities were categorized, based on historical headcount data, design capacities and staffing, and grouped into four equivalent dining facilities, under the assumption that all satellite dining facilities within a group are identical. Results and conclusions derived from the observed data, then, apply equally to all facilities comprising a single group.

The work sampling data was subsequently reduced and analyzed to determine any significant relationships pertaining to the distribution of effort, productivity, manpower and staffing requirements; and, where feasible, mathematical models were derived by regression analysis for predicting staffing requirements.

On the whole, the satellite dining facilities seem to be operating in a fairly efficient and effective manner with fewer personnel than would be required in conventional dining halls. The CFPF support provided has apparently had some impact on the relative distribution of the workload, when compared to the results of similar evaluations done at other military installations, but the allocation of time to specific tasks in certain jobs is not altogether consistent with expectations for these positions, which would be important to the proper training of food service personnel for CFPF operations. It also appears that the more efficient staffing has contributed to increasing productivity to levels comparable to that achieved in some commercial and institutional facilities. Further improvements in productivity are possible, except for the constraints of existing scheduling policies and procedures.

An interesting result of the productivity analysis within the satellite dining facilities is that the "best" utilization of personnel is attained at about 1000 meals per day, given the appropriate serving capacity and staffing. Only marginal gains in increased productivity are obtained in larger facilities, at the risk of introducing other problems which counterbalance these benefits.

Results provided for the CFPF are inconclusive, for reasons of the high degree of variability in production levels experienced, in conjunction with a significant underutilization of available productive capacity, both labor and equipment. It is our opinion that present staffing levels can support at least twice the feeding requirements existing at the time this evaluation was undertaken, and that reductions can, and should be, effected.

There is no reason to conclude that the operation of IPA or TISA is inadequate or inefficient, and no obvious discrepancies were noted.

SECTION II

INTRODUCTION

PURPOSE

This evaluation was conducted to assess the labor requirements for operating a Central Food Preparation System (CFPS), including the Satellite Dining Facilities (SDF), Central Food Preparation Activity (CFPA), and Troop Issue Support Activity (TISA), in terms of utilization of personnel, manpower and staffing. The specific objectives of the work measurement evaluation were as follows:

- (a) To measure the performance, i.e., productive and non-productive efforts, of personnel in each element of CFPS considered.
- (b) To derive correlations between levels of productive activity and productive output to estimate manpower requirements.
- (c) To determine the nature and extent of the variations in workloads for each job, necessary to develop the staffing requirements.
- (d) To establish the relative importance of work content, i.e., functional tasks, in each of the different jobs as criteria for specifying skill level and training requirements.
- (e) To provide a basis for developing the labor costs required as inputs to the economic analyses.

APPROACH

Work sampling was the method used for the measurement and quantitative appraisal of the total work situations necessary to accomplish these objectives. Following is a general description of the approach used.

a. Site Survey.

The site surveys were performed to obtain all of the information necessary to develop and implement the work sampling study. This included defining the activities and functions performed, determining the jobs and tasks at each location, personnel staffing and work schedules, job descriptions, and any other data that was required for this purpose.

b. Work Sampling Plan:

Work sampling is based on the principle that an adequate number of random samples, observed over a finite period of time, on properly selected jobs, will accurately reflect the characteristics of the total work force under similar conditions. This required careful development of the sampling schedule, such that the designated observation periods and intervals spanned all activities, functions and jobs under the variety of working conditions expected, and that the resulting samples were sufficiently large to provide the desired degree of accuracy in the data.

c. Data Collection Procedures:

Since the jobs and tasks varied widely between the different elements of the CFPS, separate data collection procedures were developed for each element. Job categories, both military and civilian, were delineated, and task categories describing all activities and functions performed on each job had to be completely defined. Then, data collection forms on which the sampling observations were systematically recorded and summarized were designed. Detailed instructions on the use of these forms were prepared, which included specifying unique computer compatible coding schemes for recording the data.

d. Training Program:

Data collection personnel were recruited and hired by the Troop Support Agency (TSA). The number of data collectors required was determined by the following parameters:

- (1) The number and physical location of the facilities involved.
- (2) The number of workers to be observed at each location.
- (3) The duration of the sampling period.
- (4) The sample size required and the frequency of observation, i.e., observation interval.

The responsibility for training the data collectors was that of the Operations Research and Systems Analysis Office (OR/SA), NARADCOM. The training program took approximately eight hours, and included formal classroom instruction on the purpose, methods and procedures of work sampling; objectives of the evaluation and utilization of the data collected; and a discussion of the data collection procedures

and use of the data forms. Subsequently, each person was provided a period of individualized training in actual data collection at one or more of the CFPS facilities. On site training was also provided at the beginning of each new phase of data collection to familiarize data collectors with any peculiarities of that element of the CFPS being observed.

e. Data Collection:

Data collection was conducted according to the established sampling plans and procedures. Supervision of the data collection was provided by NARADCOM personnel.

f. Data Reduction and Analysis:

After the work sampling data was validated, it was reduced and tabulated in such a way as to characterize productive and non-productive times for every job category by task, in each element of the CFPS. These data were subjected to appropriate statistical analysis to derive distributions and estimators for manpower and staffing requirements.

It should be recognized that this approach is limited in two important ways. First, the work sampling data is not pace-rated, which implies that the personnel were working at a uniform 100% efficiency. While this is probably an incorrect assumption, it was expected that when averaged over a large number of observations spanning a reasonable period of time, the effect any such errors as might derive from this source would become negligible. Also, it should be borne in mind that the results of the evaluation cannot be applied in situations that differ markedly from the conditions under which the work sampling was completed.

SECTION III

CONDUCT OF EVALUATION

SATELLITE DINING FACILITIES

The seven satellite dining facilities included in the work sampling varied in size and headcounts. The time and resources available for the work measurement evaluation did not permit a complete, detailed analysis in each and every facility. Thus, the facilities were categorized, based upon historical headcount data and design capacities and staffing, and grouped into four equivalent dining facilities, as follows:

<u>SDF</u>	<u>DESIGN CAPACITY</u>	<u>ACTUAL HEADCOUNT</u>	<u>STAFFING</u>	<u>EQUIVALENT FACILITY</u>
8400	500	≈ 500	24	A
8402	500	≈ 500	24	A
3701	300	> 300	19	B
3024	300	≈ 300	15	C
3108	300	≈ 300	17	C
3118	300	≈ 300	16	C
9304	300	< 300	14	D

The work sampled was then appropriately divided among the group of satellite dining facilities comprising an equivalent dining facility. This implicitly assumes that the satellite dining facilities within a group are essentially identical, and that the results and conclusions derived from the observed data for the total group applies to all of those facilities. It should be noted that some slight changes in headcounts and staffing in the satellite dining facilities occurred just prior to the start of work sampling, but did not require this plan to be altered.

Work sampling in the satellite dining facilities was conducted over an eight week calendar period. The actual number of days each equivalent facility was surveyed is indicated below:

<u>EQUIVALENT FACILITY</u>	<u>WEEKDAYS</u>	<u>WEEKENDS</u>	<u>WEEKS OF DATA</u>
A	5	2	1
B	5	2	1
C	10	4	2
D	5	2	1

Data collection was performed in the satellite dining facilities for periods corresponding to one half of the working day, as determined by the operating schedule of each dining facility:

<u>SDF</u>	<u>WEEKDAY PERIODS</u>		<u>WEEKEND PERIODS</u>	
	<u>1st</u>	<u>2nd</u>	<u>1st</u>	<u>2nd</u>
3024	0430-1215	1220-2000	0600-1300	1305-2000
3108	0430-1205	1210-1945	0600-1245	1250-1930
3118	0430-1215	1220-2000	0600-1245	1250-1930
3701	0400-1200	1205-2000	0600-1245	1250-1930
8400	0430-1215	1220-2000	0600-1300	1305-2000
8402	0345-1145	1150-1945	0600-1215	1220-1930
9304	0430-1145	1150-1900	0600-1215	1220-1900

The data collection periods were randomly designated throughout the eight weeks of work sampling in the satellite dining facilities, as shown in Appendix A, to balance day-to-day effects, variations in headcounts between pay periods, and other biasing factors.

Each person included in the evaluation was identified by worker category.

<u>CODE</u>	<u>WORKER CATEGORY</u>
1	Supervisor, Military
2	Supervisor, Civilian
3	Cook, Military
4	Cook, Civilian
5	Clerk, Military
6	Food Service Worker, Civilian

The functions performed by the personnel were recorded as specified below. Detailed definitions of the task categories are provided in Appendix B.

<u>CODE</u>	<u>TASK CATEGORY</u>
11	Prepares Food for Cooking
12	Cooks Food
13	Prepares Soups, Salads, Desserts, & Breads
14	Prepares Cooking Equipment
21	Serves on "A" Line
22	Replenish Serving Lines
23	Serves on Short Order Line
31	Cleans Kitchen
32	Cleans Dining Room
33	Cleans Serving Line
34	Dishwashing

CODE	<u>TASK CATEGORY</u>
41	Receives Supplies
42	Maintains Supplies
43	Issues Supplies
50	Supervision
60	Administrative
71	Scheduled Breaks
72	Absent
73	Idle
74	Forced Delay

To facilitate data collection, each worker wore a pre-assigned number, conspicuously displayed, for the duration of the evaluation. A cross reference list identified the number with their job function, element of CFPS, grade, and work location, (e.g., 33, Military Cook, SDF, E4, 9304). Observations were recorded at five minute intervals indicating the activity of each worker on the data forms provided, in accordance with the instructions provided during the training of data collectors. See Appendix B. The forms were submitted daily to the data collection supervisor for review and validation prior to coding for data reduction and analysis.

CENTRAL FOOD PREPARATION (CFPA)

The central food preparation activity included both the central food preparation facility (CFPF) and the ingredient preparation activity (IPA). These two areas were work sampled simultaneously over a two week interval, ten working days, as indicated in Appendix A. The normally scheduled work day in the CFPF was from 0600-1700 hours, with the work force operating on three staggered shifts. In the IPA, the scheduled work day was from 0530-1400 hours daily.

Data collection procedures were essentially identical to those employed in the satellite dining facilities, excepting that worker and task categories were defined slightly differently to conform to the different functions and activities:

CODE	<u>WORKER CATEGORY</u>
1	Supervisor, Military
2	Supervisor, Civilian
3	Cook, Military
4	Cook, Civilian
5	Baker, Civilian
6	Food Service Worker, Civilian
7	Warehouseman
8	Administrative
9	Janitors

CODE	TASK CATEGORY
11	Ingredient Preparation
12	Entree Preparation
13	Dessert Preparation
21	Portioning
22	Packaging
23	Freezing
24	Packing
25	Storing
31	Sanitation, Equipment
32	Sanitation, Entree/Ingredient Preparation Spaces
33	Sanitation, Dessert Preparation Spaces
34	Sanitation, Storage/Other Spaces
41	Inventory/Maintenance
42	Shipping/Receiving
50	Supervision
60	Administrative
71	Scheduled Breaks
72	Absent
73	Idle

Detailed definitions of the task categories are included in Appendix C.

TROOP ISSUE SUPPORT ACTIVITY

The survey period for TISA was ten work days with a shift duration of eight and one half hours (0730-1600) per day according to the schedule in Appendix A. Data was collected simultaneously at two physical work locations, the perishable storage warehouse and the non-perishable storage warehouse, as well as providing for limited coverage of the transportation of ingredients and/or products to and from the CFPA and satellite dining facilities.

Observations were recorded at fifteen minute intervals for the duration of the work sampling period. Otherwise, the data collection procedures were as already described for the satellite dining facilities and the CFPA. Worker and task categories, which are defined in detail in Appendix D, were as follows:

CODE	WORKER CATEGORY
1	Warehouseman, Foreman
2	Warehouseman
3	Motor Vehicle Operator

CODE	TASK CATEGORY
11	Receiving/CFPF
12	Receiving/IPA
13	Receiving/SDF
14	Receiving/Other
21	Warehouse Operation
31	Shipping, CFPF
32	Shipping, IPA
33	Shipping, SDF
34	Shipping, Other
41	Transportation/CFPF
42	Transportation/IPA
43	Transportation/SDF
50	Supervision
60	Administrative
71	Scheduled Breaks
72	Absent
73	Idle

SECTION IV

RESULTS AND OBSERVATIONS

The data collected during the work sampling were subsequently reduced and analyzed across several dimensions to derive significant relationships relevant to the distribution of effort, productivity, and manpower and staffing requirements. The findings resulting from these analyses are discussed for each separate element of the CFPS included in the work measurement.

SATELLITE DINING FACILITIES

Observations on the activities performed in the satellite dining facilities were tabulated and summarized in Table 1 to produce the distribution of workload among the various work functions, and estimates of the levels of productivity obtained during an average week of operation. The results are shown in terms of man hours instead of the number of observations recorded to allow for more meaningful interpretation.

TABLE 1
DISTRIBUTION OF WORKLOAD BY WEEK
SATELLITE DINING FACILITIES

	<u>A</u>		<u>B</u>		<u>C</u>		<u>D</u>	
	<u>M-HRS</u>	<u>%</u>	<u>M-HRS</u>	<u>%</u>	<u>M-HRS</u>	<u>%</u>	<u>M-HRS</u>	<u>%</u>
Sanitation	415.84	34.78	325.09	34.72	266.75	38.29	266.49	37.04
Food Prep.	208.41	17.43	142.75	15.25	99.34	14.26	94.08	13.08
Serving	177.67	14.86	139.50	14.90	87.92	12.62	81.50	11.33
Administration	69.42	5.81	55.92	5.97	60.04	8.62	68.17	9.47
Supervision	36.83	3.08	25.42	2.72	21.63	3.11	29.92	4.16
Supply	18.93	1.58	15.42	1.65	11.33	1.63	11.91	1.66
Productive	927.10	77.55	704.10	75.21	547.01	78.52	552.07	76.73
Non-Prod.	268.42	22.45	232.09	24.79	149.60	21.48	167.41	23.27
Total	1195.52	100.00	936.19	100.00	696.61	100.00	719.48	100.00

A - 8400 and 8402
B - 3701
C - 3024, 3108, and 3118
D - 9304

A comparison of the distribution of workloads between dining facilities indicates that they are very similar in terms of the percentage of time allocated to the various functions. Consequently, the relative proportion of productive and non-productive times expressed as percentages of the total time expended, tends to be highly uniform over all dining facilities. Of course, the actual productive man hours required increases with the headcounts supported by the dining facilities, which is reflected in the individual work functions as well.

The most labor intensive operation is sanitation, which includes cleaning the kitchen, dining room, serving lines and self-service areas, in addition to warewashing. Of the time spent in sanitation, about 44% was for warewashing, 27% cleaning the kitchen, and approximately 15% each in cleaning the serving line and self-service areas, and the dining room.

Food preparation was the second most labor demanding operation, of which 41% was in preparing food for cooking, 36% in actually cooking the food, 19% for preparing soups, salads, desserts and breads and other items, and the remainder was spent in setting up and monitoring the cooking equipment.

The time required for serving was, on the average, split 55% on the "A" ration serving line, 11% on the short order line, and 34% in replenishing the serving lines. There is no consistent policy for offering short order service in the dining facilities, except that it is included only with the lunch meal. In some cases, the short order menu is available every day or every weekday, but in most instances, is offered just two days a week.

The remaining three work categories---administration, supervision, and supply---collectively accounted for 11-12% of the total man hours observed in the satellite dining facilities.

Comparing the same data, averaged for all satellite dining facilities, Table 2, the differences in the distribution of the workload on weekdays versus weekends is evident. About 25% fewer man hours labor is required on weekends than on weekdays.

TABLE 2
DISTRIBUTION OF WORKLOAD BY DAY
SATELLITE DINING FACILITIES

	<u>WEEKDAY</u>		<u>WEEKEND</u>		<u>DIFFERENCE</u>
	<u>M-HRS</u>	<u>%</u>	<u>M-HRS</u>	<u>%</u>	<u>M-HRS</u>
Sanitation	191.29	34.96	159.44	39.14	+ 31.85
Food Preparation	83.23	15.21	64.25	15.77	+ 18.98
Serving	75.18	13.74	55.36	13.59	+ 19.82
Administration	42.73	7.81	19.94	4.90	+ 22.79
Supervision	18.46	3.37	10.75	2.64	+ 7.71
Supply	9.55	1.75	4.92	1.21	+ 4.63
Productive	420.44	76.85	314.66	77.25	+ 105.78
Non-Productive	126.68	23.15	92.67	22.75	+ 34.01
Total	547.12	100.00	407.33	100.00	+ 139.79

Operating procedures and staffing policies in the satellite dining facilities explain a large proportion of these variations. For example, a military clerk, whose primary function is administration, does not routinely work on weekends. Also, since deliveries by the Troop Support Issue Activity and vendors are not normally made on weekends, the man hours expended on supply functions are considerably less. Finally, headcounts are typically lower on weekends, which, effectively reduces the labor requirements in the other functional work areas.

An examination of the distribution of the workload, averaged over all satellite dining facilities for a week, shown in Table 3, is also very revealing:

a. For the military supervisor, the greatest percentage of time is spent on administrative, 31%. Non-productive time accounts 26% of their time, over half of which resulted from the supervisors being absent from the dining facilities. The supervisor spends only 21% of his time on supervisory duties.

b. Civilian supervisors are involved 36% of the time in food preparation, 19% on the serving lines, 16% at sanitation duties, and 14% is non-productive time. In effect, they are senior cooks, more so than supervisors, which requires little more than 5% of their time.

c. Military and civilian cook positions differ little with regard to the distribution of workload. About 28% of their time is for food preparation, 24% on the serving lines, and 6-8% for supply, supervision and administration. The exceptions are that civilian cooks spend relatively more time on sanitation functions, and military cooks show correspondingly greater non-productive time. Thus, the workload, in productive man hours, is unbalanced in favor of the military cooks.

d. The military clerk expends 60% of his time on administrative duties. Occasionally, in the absence of other dining facility staff, the clerk may be pressed into service to perform other functions. Overall, they are non-productive 26% of the time.

e. Sanitation is the primary responsibility of the food service worker, 58% of their time. The majority of the remaining time, slightly over 16% in food preparation and serving, was usually devoted in assisting with making of salads, portioning and plating dessert items, and in supporting the serving lines. The 24% non-productive time was somewhat higher than for the other civilian workers, because of the high degree of variability in the daily workload.

f. Temporary military personnel were utilized on an ad hoc basis in satellite dining facilities 8400 and 8402, equivalent dining facility A, because of instabilities in the headcounts and workloads during initial start up operations. The temporary help was subsequently eliminated from these dining facilities, and these data are not pertinent to the work measurement evaluation.

TABLE 3

DISTRIBUTION OF WORKLOAD BY WORKER CATEGORY

SATELLITE DINING FACILITIES

	M-Hrs ‡	Military Supervisor	Civilian Supervisor	Military Cook	Civilian Cook	Military Clerk	Food Service Worker	Temporary Military
Sanitation		16.92 5.18	25.42 15.60	101.70 15.96	99.33 21.60	1.46 1.03	1028.34 57.92	1.00 2.30
Food Preparation	M-Hrs ‡	20.75 6.35	57.87 35.51	176.87 27.75	127.13 27.65	2.76 1.95	155.87 8.78	3.33 7.66
Serving	M-Hrs ‡	18.84 5.76	31.59 19.39	151.67 23.80	113.37 24.66	6.74 4.75	130.88 7.37	33.50 77.03
Administration	M-Hrs ‡	102.67 31.42	11.75 7.21	25.13 3.94	12.71 2.76	84.83 59.79	16.38 0.92	0.08 0.18
Supervision	M-Hrs ‡	69.83 21.37	8.75 5.37	11.63 1.82	10.38 2.26	5.13 3.62	8.08 0.46	0.00 0.00
Supply	M-Hrs ‡	13.00 3.98	4.66 2.86	12.63 1.98	6.74 1.47	4.26 3.00	16.30 0.92	0.00 0.00
Productive	M-Hrs ‡	242.01 74.05	140.04 85.94	479.63 75.25	369.66 80.39	105.18 74.13	1355.85 76.37	37.91 87.17
Non-Productive	M-Hrs ‡	84.80 25.95	22.92 14.06	157.76 24.75	90.16 19.61	36.71 25.87	419.59 23.63	5.58 12.83
Total	M-Hrs ‡	326.81 100.00	162.96 100.00	637.39 100.00	459.82 100.00	141.89 100.00	1775.44 100.00	43.49 100.00

The distribution of productive and non-productive time by hour of the day is illustrated in Figure 1 for a typical satellite dining facility. Although the specific details may vary, this distribution generally describes the conditions for all of the facilities in any daily or weekly time period. The most important feature to note in Figure 1 is the unevenness of the distribution of the workload. The periodic depressions in the productive time curve indicates meal times for the dining facility employees, which are recorded as scheduled delays/non-productive time. This figure represents a situation where fairly efficient staffing can be accomplished, within the constraints of existing personnel scheduling policies, i.e., continuous 8.5 hour shifts for five consecutive days. Non-productive time, the difference between the total and productive time curves in Figure 1, could be decreased to some extent by employing part-time personnel or scheduling full-time personnel on split shifts.¹ The peak total time between the seventh and eleventh hours of operation result from shifts overlapping. Although it cannot be conclusively demonstrated from the work sampling data, it is believed that the higher productive time during this period is artificially induced by the availability of a larger number of personnel, probably working at less than normal efficiency. However, generally higher headcounts at lunch, to some extent, also contribute to this effect.

Measures of productivity in the equivalent dining facilities, defined as the ratio of output, meals served or headcount, to inputs, or total man hours expended, are provided in Table 4. Not surprisingly, productivity improves with higher headcounts, as reflected in comparison of the different sized dining facilities.

¹Smith, R. S., "Two-Phase Employee Scheduling Algorithm for Operations Having Variable Manpower Requirements with Application Involving Single and Composite Planning Cycles", Doctoral Dissertation, University of Massachusetts, February, 1975.

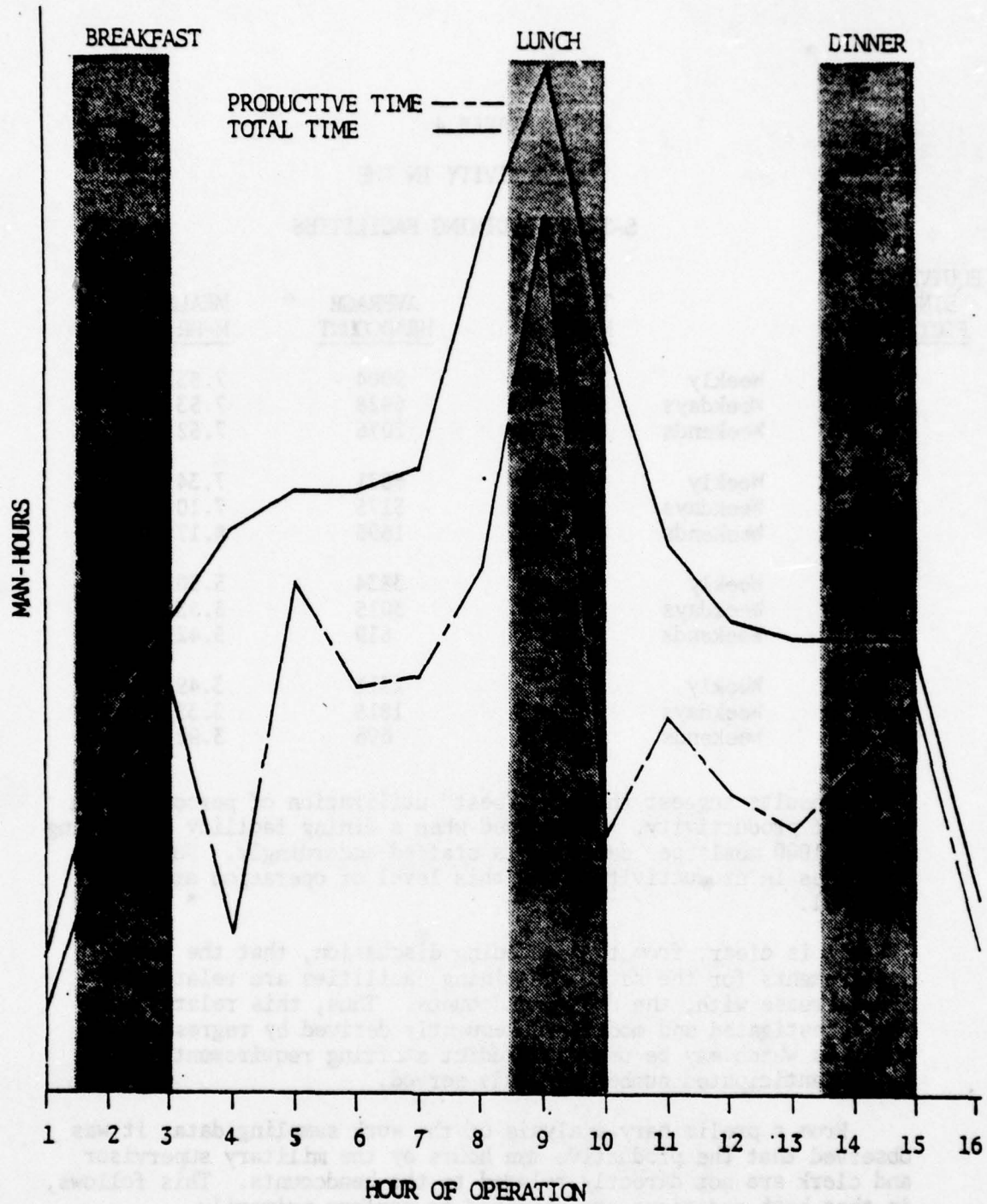


FIGURE 1: DISTRIBUTION OF WORKLOAD BY HOUR OF DAY
FOR TYPICAL SATELLITE DINING FACILITY

TABLE 4
PRODUCTIVITY IN THE
SATELLITE DINING FACILITIES

<u>EQUIVALENT DINING FACILITIES</u>		<u>TOTAL M-HRS</u>	<u>AVERAGE HEADCOUNT</u>	<u>MEALS/ M-HR</u>
A	Weekly	1195.52	9004	7.53
	Weekdays	919.50	6928	7.53
	Weekends	276.02	2076	7.52
B	Weekly	936.19	6871	7.34
	Weekdays	728.59	5175	7.10
	Weekends	207.60	1696	8.17
C	Weekly	696.61	3834	5.50
	Weekdays	545.60	3015	5.53
	Weekends	151.01	819	5.42
D	Weekly	719.48	2511	3.49
	Weekdays	541.92	1815	3.35
	Weekends	177.56	696	3.92

These results suggest that the "best" utilization of personnel, in terms of productivity, is obtained when a dining facility is serving around 1000 meals per day, and is staffed accordingly. Further increases in productivity above this level of operation are only marginal.

It is clear, from the preceding discussion, that the labor requirements for the satellite dining facilities are related to, and increase with, the daily headcounts. Thus, this relationship was investigated and models subsequently derived by regression analysis which may be used to predict staffing requirements based on the anticipated number of meals served.

From a preliminary analysis of the work sampling data, it was observed that the productive man hours by the military supervisor and clerk are not directly related to the headcounts. This follows, in that both positions are intended to perform primarily supervisory and/or administrative duties, on which headcounts have negligible effect within reasonable limits. But, the productive

man hours required for the remaining jobs was highly responsive to changing headcounts. Further, because the functions of the civilian supervisors and military and civilian cooks are so similar, their combined productive man hours show a better relationship to daily headcount than if each job category was considered separately. Finally, it was determined that there was a higher correlation between productive man hours and daily headcount if the weekday and weekend data were treated independently.

Thus, six models were developed and are presented in Table 5. These models predict the manpower requirements for cooks (worker categories 2, 3 and 4), food service workers (category 6) and the total for all job categories on weekends and weekdays. It is assumed that an individual provides 6.75 productive man hours per day. This was derived by considering a work shift of 8.5 hours per day. Of this time, 0.5 hours is scheduled for meals and two fifteen minute breaks are allowed. Ten percent of the remaining 7.5 hours is considered as an acceptable level of absent and idle time, which yields 6.75 hours of productive time. No adjustments were made in these models for time lost to annual or sick leave, training and field exercises, or any other causes. The results shown in Table 6 are estimated manpower requirements, which generally will be less than actual staffing, in practice, because of the inefficiencies in personnel scheduling policies and procedures.

TABLE 5
STAFFING MODELS

<u>WORKER CATEGORY</u>	<u>WEEKDAYS</u>	<u>WEEKENDS</u>
Total Staffing	$M = 7.8628 + 0.009H^*$ $r^2 = 0.913$	$M = 6.5735 + 0.007H$ $r^2 = 0.897$
Cooks	$M = 1.9174 + 0.0043H$ $r^2 = 0.8784$	$M = 2.0339 + 0.0032H$ $r^2 = 0.9049$
Food Service Workers	$M = (0.8788)H^{0.3182}$ $r^2 = 0.872$	$M = (0.5991)H^{0.3618}$ $r^2 = 0.885$

*M = Number of Personnel Required
H₂ = Daily Headcount
r² = Coefficient of Determination

TABLE 6
STAFFING REQUIREMENTS

<u>WEEKDAYS</u>				<u>WEEKENDS</u>			
<u>Headcount</u>	<u>Cooks</u>	<u>Food Service Workers</u>	<u>Total</u>	<u>Headcount</u>	<u>Cooks</u>	<u>Food Service Workers</u>	<u>Total</u>
200-237	3	5	10	200-299	3	5	9
238-252	3	6	11	300-342	4	5	9
253-349	4	6	11	343-352	4	5	10
350-419	4	6	12	353-483	4	6	10
420-460	4	7	12	484-583	4	6	11
461-484	4	7	13	584-614	4	7	11
485-571	5	7	13	615-764	5	7	12
572-682	5	7	14	765-892	5	7	13
683-717	5	8	15	893-905	5	8	13
718-793	6	8	15	906-927	5	8	14
794-904	6	8	16	928-1046	6	8	14
905-950	6	8	17	1047-1187	6	8	15
951-1014	7	8	17	1188-1239	6	8	16
1015-1035	7	8	18	1240-1290	7	8	16
1036-1126	7	9	18	1291-1328	7	9	16
1127-1182	7	9	19	1329-1470	7	9	17
1183-1236	8	9	19				
1237-1348	8	9	20				
1349-1415	8	9	21				
1416-1461	8	9	21				

CENTRAL FOOD PREPARATION FACILITY

The distribution of the workload among worker categories in the CFPPF, averaged over the two week work sampling period, is contained in Table 7. Overall non-productive time was greater than for any other single task category, but varied widely between the individual jobs. As was observed in the satellite dining facilities, non-productive time was greater for military personnel than for the civilian employees, but generally appeared to be excessive in almost all cases. Food preparation and portioning and packaging are the most labor intensive operations. However, a significant portion of the productive labor was devoted to administration, which may, perhaps, be attributed partly to the need for maintaining thorough records during the evaluation of the CFPPF.

TABLE 7

DISTRIBUTION OF WORKLOAD BY WEEK

	CENTRAL FOOD PREPARATION FACILITY										ADMINISTRATIVE PERSONNEL		JANITORS		TOTAL	
	MILITARY SUPERVISOR		CIVILIAN SUPERVISOR		MILITARY COOKS		CIVILIAN COOKS		CIVILIAN BAKERS		FOOD SERVICE WORKERS		WAREHOUSE MEN		PERSONNEL	
	M-HR	\$	M-HR	\$	M-HR	\$	M-HR	\$	M-HR	\$	M-HR	\$	M-HR	\$	M-HR	\$
FOOD PREPARATION	0.5	1.0	29.2	36.2	45.3	40.8	34.0	43.2	78.0	53.6	50.0	27.0	0.0	0.0	0.1	0.1
PORTIONING/ PACKAGING	1.3	2.7	6.9	8.6	22.4	20.2	17.2	21.9	27.8	19.1	63.1	34.1	5.4	8.5	0.0	0.0
SANITATION	0.0	0.0	0.3	0.4	1.6	1.4	1.1	1.4	1.8	1.2	18.1	9.8	1.3	2.0	0.1	0.1
SUPPLY	0.4	0.8	0.9	1.1	1.9	1.7	0.8	1.0	0.9	0.6	1.1	0.6	17.8	28.0	0.0	0.0
SUPERVISION	14.9	31.0	14.6	18.1	5.4	4.9	2.3	2.9	0.3	0.2	0.8	0.4	1.3	2.0	18.4	12.6
ADMINISTRATION	16.6	34.5	9.0	11.2	3.0	2.7	2.2	2.8	1.3	0.9	1.8	1.0	23.8	37.4	91.0	62.5
PRODUCTIVE	33.7	70.1	60.9	75.6	79.6	71.6	57.6	73.2	110.1	75.7	134.9	73.0	49.6	78.0	109.6	75.2
NON-PRODUCTIVE	14.4	29.9	19.7	24.4	31.5	28.4	21.1	26.8	35.4	24.3	50.0	27.0	14.0	22.0	36.1	24.8
TOTAL	48.1	100.0	80.6	100.0	111.1	100.0	78.7	100.0	145.5	100.0	184.9	100.0	63.6	100.0	145.7	100.0
															1138.2	100.0

Taking a different viewpoint, the data indicate that the time spent on different tasks in each job category seems to be reasonably consistent with expectations. The one exception is that warehousemen spend an inordinate amount of their time on administrative duties, for which no plausible explanation can be offered. Again, as noted in the dining facilities, civilian supervisors were involved in a supervisory capacity far less than might be presumed for such a position.

Evaluating productivity cast considerable doubt on the validity of the results of the work sampling analysis. Although the data are sufficiently precise for this purpose, and the results presented can be justified on this basis, it is felt that the conditions under which the work sampling was conducted were not realistic. The data provided in Table 8 is the reported production of portions of entrees, selected vegetable items, and soups, sauces and gravies in the CFPF for each month up to and including the month of June, in which the work sampling was accomplished. No significant changes in equipment capacities or staffing occurred during that time. Yet, the production levels varied from approximately 60,000 to over 195,000 portions per month. If the nominal production capacity of the CFPF is set at 200,000 portions per month, a not unreasonable assumption under the circumstances, actual production has been only 30-35% of capacity following the start-up of operations in February and March when most production was to establish inventory. Even during work sampling, when some effort was made to achieve a degree of similitude in order that the results adequately reflected the true potential of the CFPF, only slightly more than 40% of capacity was utilized. During the remainder of June, production was at about only 8.5% of capacity, to balance overproduction during the work sampling.

The consequence of such gross underutilization of available capacity, particularly with reference to labor, is that considerable instability and inefficiencies in operations can be tolerated without degrading effectiveness, i.e., fulfilling production requirements. That production was unstable is readily apparent when examining average production by day of the week, Table 8, which varied by an order of magnitude during the five months of operation. Since pace rating could not be done during the work sampling, the data will not support unqualified conclusions regarding operational efficiency. However, based on informal

qualitative evaluations and "expert opinion", that can be substantiated by citing numerous specific examples, there is certainly reason to question how efficient CFPF production operations really were during the time the data was collected.

TABLE 8
CFPF ENTREE PRODUCTION

	<u>FEBRUARY</u>	<u>MARCH</u>	<u>APRIL</u>	<u>MAY</u>	<u>JUNE</u>	<u>WORK SAMPLING PERIOD</u>
Monthly	170,173	195,098	70,812	68,871	60,739	42,566
Average Daily Production	8,956	8,483	5,058	3,443	3,197	4,257
Average Monday Production	11,296	9,505	5,174	4,012	2,750	3,914
Average Tuesday Production	9,509	9,177	5,090	3,015	3,154	5,632
Average Wednesday Production	8,641	7,549	5,892	4,653	5,458	7,637
Average Thursday Production	9,259	9,055	5,165	4,595	4,422	4,788
Average Friday Production	6,660	7,469	3,424	1,338	2,148	1,138

It is our considered opinion that productive man-hours presented in Table 7, although actually observed, are biased by a "Parkinson's Law" effect, i.e., work expands to fill the time available, and that activity recorded as productive effort was more often, than not, performed at less than 100% efficiency. Therefore, the results and findings in this area are suspect.

Despite a lack of confidence in the data, an attempt was made to derive manpower requirements models for the CFPF, similar to those developed for the satellite dining facilities. A variety of possible measures of production were assessed, e.g., dollar volume and pounds of food processed, other than number of portions produced. Regression models of various kinds --- linear, exponential, power function, and multivariate --- were fit to data, for the separate job categories and for combined groups of the data. The coefficients of determination for these models ranged from a low of $r^2 = .002$, which indicated no relationship existed among the variables, to a maximum $r^2 = .45$, which is still too low for the model to be useful for predicting staffing requirements. At best, the results of this exercise tended to confirm the opinions expressed above.

The only guidelines for staffing the CFPF that can be offered, at this time, are based on the following argument. Production during the months April through June, was at about ten times the average daily headcounts in the satellite dining facilities, 6000-7000 meals per day. If the CFPF, with the observed staffing levels, has an actual production capacity of 200,000 portions a month, essentially as demonstrated in February and March it is conservatively estimated as being able to support over 15-16,000 meals a day without increasing total staffing. Conversely, it is suggested that to continue to operate at these lower levels, some reductions in CFPF staffing could, and should be, achieved.

INGREDIENT PREPARATION ACTIVITY

Operations in the IPA differ from those at the central kitchen, as shown in the workload distribution in Table 9. The main function of this activity is the preparation and packaging of raw ingredients including shredding, packing and weighing of vegetables and fruits for the satellite dining facilities to use in salad and meal preparation and for CFPF production. As in the CFPF, most of the effort is in food preparation, portioning and packaging, and sanitation. Since little cooking is required, the greatest emphasis is on portioning and packaging operations. Non-productive time, 19%, is lower than for either of the two elements of the CFPF already discussed.

TABLE 9
DISTRIBUTION OF WORKLOAD
INGREDIENT PREPARATION ACTIVITY

	MILITARY SUPERVISOR		MILITARY COOKS		CIVILIAN COOKS		FOOD SERVICE WORKERS		TOTAL	
	M-HR	%	M-HR	%	M-HR	%	M-HR	%	M-HR	%
Food Preparation	1.96	9.33	24.14	16.52	17.47	21.67	42.49	25.06	86.06	20.61
Portioning-Packaging	0.40	1.92	34.00	23.27	20.67	25.63	39.40	23.24	94.47	22.63
Sanitation	1.07	5.09	19.02	13.02	17.44	21.64	49.43	29.16	87.01	20.84
Supply	0.86	4.10	8.26	5.66	1.96	2.43	2.53	1.49	13.61	3.26
Supervision	4.46	21.23	6.24	4.27	2.79	3.46	1.13	0.66	14.65	3.51
Administration	6.72	32.01	27.50	18.82	5.65	7.01	2.81	1.66	40.55	9.71
Productive	15.47	73.68	116.92	80.02	65.99	81.84	137.78	81.28	336.36	80.57
Non-Productive	5.53	26.32	29.19	19.98	14.64	18.16	31.74	18.72	81.14	19.43
Total	21.00	100.00	146.11	100.00	80.63	100.00	169.51	100.00	417.50	100.00

The military supervisor spends most of his time in administration and supervision, 53%, but a relatively high percentage of time was non-productive. It should be noted, however, that during the two weeks of work sampling in the IPA, the military supervisor was available for only half of the time, thus these data may not provide an accurate profile of normal operations. Much of the administrative work was performed by military cooks since no specific position was provided for this purpose.

Ingredient preparation did not maintain records on daily production, and the only available production data was the issues and receipts on any given day. These records were inadequate for determining a meaningful measure of productivity. For the same reasons, staffing models could not be derived.

TROOP ISSUE SUPPORT ACTIVITY

The warehousing operation was the only part of this activity work sampled. It was assumed that the CFPS would otherwise have little or no effect on the overall workload in the administrative area. The allocation of time for each of the major tasks in all job categories, Table 10, is as expected. Non-productive time was only 17% of the total time, considerably lower than for any other element of the CFPS included in the work measurement evaluation.

The main function of the TISA is to supply the dining facilities, central kitchen and ingredient preparation with the raw materials needed for day to day operations. Therefore, the dollar volume of materials handled is summarized on a daily basis, in Table 11, as a measure of production output. Dividing the total cost of material handled by total man hours the estimated productivity is \$75.12 per man hour. Unfortunately, this value of productivity could be biased by the manner in which the CFPPF was operated during the work sampling period. The level of production in the CFPPF was very low during that time, so that the volume of materials handled and transported to CFPPF was correspondingly reduced far below that which would be observed in normal operations.

A variety of regression models were fitted to the production data available, but none could be determined which is sufficient for predicting manpower requirements. The maximum coefficient of determination obtained was $r^2 = 0.17$.

TABLE 10
DISTRIBUTION OF WORKLOAD BY WEEK
TROOP ISSUE SUPPORT ACTIVITY

	<u>FOREMAN</u>		<u>WAREHOUSEMAN</u>		<u>DRIVER</u>		<u>TOTAL</u>	
	<u>M-HR</u>	<u>%</u>	<u>M-HR</u>	<u>%</u>	<u>M-HR</u>	<u>%</u>	<u>M-HR</u>	<u>%</u>
Receiving	0.13	0.16	18.50	5.31	8.13	9.12	26.76	5.13
Warehouse Operation	6.88	8.21	233.75	67.05	7.88	8.84	248.51	47.65
Shipping	0.25	0.30	21.75	6.24	22.00	24.68	44.00	8.44
Transportation	0.00	0.00	2.25	0.65	24.00	26.92	26.25	5.03
Supervision	21.75	25.96	2.13	0.61	0.25	0.28	24.13	4.63
Administration	42.88	51.19	15.75	4.52	1.25	1.40	59.88	11.48
Productive	71.89	85.82	294.13	84.37	63.51	71.25	429.53	82.36
Non- Productive	11.88	14.18	54.50	15.63	25.63	28.75	92.01	17.64
Total	83.77	100.00	348.63	100.00	89.14	100.00	521.54	100.00

TABLE 11

TISA PRODUCTION

FROM	TO	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	TOTAL
Cold Storage	SDF	\$6690.61	\$ 8.55	\$4725.57	-	\$4768.08	\$16192.80
Dry Storage		1716.77	374.55	1386.58	\$ 462.06	1940.14	5880.09
Central Kitchen		1783.76	107.38	2695.22	10.64	3183.39	7780.38
Dessert Kitchen		511.43	-	435.32	-	402.75	1349.50
Ingredient Preparation		824.40	7.47	315.24	-	802.64	1949.74
	Sub-Total	\$11526.96	\$497.94	\$9557.92	\$ 472.70	\$11096.99	\$33152.51
TISA	Ingredient Preparation	\$289.39	-	\$888.03	\$164.62	\$331.94	\$1678.88
TISA	Central Kitchen	-	-	-	\$287.77	\$895.07	\$1182.83
TISA	Dessert Kitchen				1491.65	1673.70	3165.85
	Sub-Total	\$289.39		\$888.03	\$1944.03	\$2900.70	\$6027.56
	Grand Total	\$11526.96	\$497.94	\$10445.95	\$2416.73	\$13997.69	\$39180.07

SECTION V

CONCLUSIONS

a) The workloads in the satellite dining facilities, as a function of the percentage total man hours actually observed, is quite different than the results obtained in similar work measurement evaluations at other military installations.^{2,3,4} It appears, then, that CFPF support does impact on the distribution of effort within the dining facilities, although total man hours required in satellite dining facilities is less than for conventional dining hall operations.

b) The percentage of non-productive time observed in the satellite dining facilities, approximately 23% of total man hours expended, compares very favorably to commercial food service operations, and to a standard of 20.6% for an 8.5 hour shift.⁵ Although not conclusively supported by available data, this is thought to have resulted because of the more efficient, realistic staffing of the satellite dining facilities.

c) The distribution of workloads in the satellite dining facilities for the individual job categories indicates that the work being performed by personnel in some positions is not entirely consistent with what may be expected on the basis of their job descriptions. A glaring example of this condition is the large amount of time allocated to food preparation operations by civilian supervisors (much more than for cooks!), as compared to the very limited amount of time, slightly more than 5%, spent on supervision. These results may have implications with regard to recruiting and training food service personnel.

²Giglio, R. J., et al, "A Methodology to Estimate Work Force Requirements in Military Food Service Facilities", Department of Industrial Engineering and Operations Research, University of Massachusetts, Amherst, Massachusetts, November, 1977.

³Bustead, R. L., et al, "CAFe System Experiment at Fort Lewis, Washington", US Army Natick Laboratories, Natick, Massachusetts, December, 1972.

⁴Davis, M. M. and Wetmiller, J. R., "A Work Analysis of Food Service Personnel at Travis AFB, California", US Army Natick Laboratories, Natick, Massachusetts, July, 1973.

⁵"Labor Productivity in Selected Civilian Cafeterias",
Mixon, J. A. and Associates, Chevy Chase, Maryland, April, 1977.

d) Some non-productive time occurs in the satellite dining facilities because of the inability to schedule personnel in the most efficient manner. Improvements may be obtained by using part-time personnel, or full-time personnel working split shifts, or by providing greater flexibility in scheduling to meet the actual workload requirements.

e) Based on these data, satellite dining facilities serving around 1000 meals per day seem to provide for the "best" utilization of personnel as measured by meals per man hour. Facilities serving a larger number of meals are only marginally more effective in this respect, and may introduce other problems, e.g., long waiting lines, or the facility may be located at excessive distances from some portion of the assigned population, which offset these benefits.

f) Staffing levels in the central kitchen appeared to be more than sufficient during the work sampling period. Although the results of the work sampling suggests a highly productive work force, two factors must be considered. First, there was a high degree of variability in the production levels on a day to day, as well as from month to month, with an essentially constant work force. Secondly, at least some of the existing volume production equipment was not effectively utilized during the sampling period, if at all. As an example, pie filling operations were often performed manually involving up to five food service personnel, when a pie-filling machine was available that required only two people and operated much faster. Ostensibly, the reason for not using the filling machine is that it took excessive clean up time. Since the work sampling was intended to measure the effects of a CFPP on personnel performance and requirements, such procedures preclude developing valid conclusions from the data.

g) The distribution of workload in the IPA and TISA elements was about as expected and did not reveal any inexplicable contradictions. Both of these components showed, overall, a lower percentage of non-productive manhours than either the satellite dining facilities or the CFPP, even less than the proposed standard of 21% non-productive time. This may be attributed to the fact that TISA functions were not substantially changed by the CFPS, and Fort Lee had more than two years of experience with the IPA prior to the evaluation, hence were more stable and manageable than the newer elements of the CFPS.

APPENDIX A

B (A-1)

APPENDIX A
WORK SAMPLING SCHEDULE

APRIL

<u>PERIOD</u>	<u>SUN</u>	<u>MON</u>	<u>TUE</u>	<u>WED</u>	<u>THU</u>	<u>FRI</u>	<u>SAT</u>
	2	3	4	5	6	7	8
2nd	X	8402 3701	9304 8400	3108 3024	3118 3701	3024 9304	X
	9	10	11	12	13	14	15
1st	X	X	3118 3024	8402 9304	8400 3701	9304 3108	3024 3701
	16	17	18	19	20	21	22
2nd	8402 3701	X	X	3701 9304	3024 8400	8402 3108	3118 3024
	23	24	25	26	27	28	29
1st	3108 3024	9304	X	X	9304 3024	3701 8402	9304 3118
	30						
2nd	9304 3108						

MAY

<u>PERIOD</u>	<u>SUN</u>	<u>MON</u>	<u>TUE</u>	<u>WED</u>	<u>THU</u>	<u>FRI</u>	<u>SAT</u>
		1	2	3	4	5	6
1st						3024	
2nd		9304 3118	3701 3024	X	X	3701	9304 8400
	7	8	9	10	11	12	13
1st	9304	3108 3118	8400 3701	3024 3108	X	X	8400
2nd	3024						
	14	15	16	17	18	19	20
1st	X	8402	9304	3701	3118	X	
2nd		3108	3118	8402	9304		3701
	21	22					
1st	3701 8402	3701					

APPENDIX A
WORK SAMPLING SCHEDULE

JUNE

<u>PERIOD</u>	<u>SUN</u>	<u>MON</u>	<u>TUE</u>	<u>WED</u>	<u>THU</u>	<u>FRI</u>	<u>SAT</u>
					1	2	3
					TISA	TISA	X
	4	5	6	7	8	9	10
	X	TISA	TISA	TISA	TISA	TISA	X
	11	12	13	14	15	16	17
	X	TISA	TISA	TISA	X	CFPA	X
	18	19	20	21	22	23	24
	X	CFPA	CFPA	CFPA	CFPA	CFPA	X
	25	26	27	28	29	30	
	X	CFPA	CFPA	CFPA	X	CFPA	

APPENDIX B

B(B-1)

APPENDIX B
DATA COLLECTION FORMS
SATELLITE DINING FACILITIES

WORKER CATEGORIES

CODE	CATEGORY
1	Supervisor, Military
2	Supervisor, Civilian
3	Cook, Military
4	Cook, Civilian
5	Clerk, Military
6	Food Service Worker, Civilian

TASK CATEGORIES

CODE	CATEGORY
11	Prepares Food for Cooking
12	Cooks Food
13	Prepares Soups, Salads, Desserts & Breads
14	Prepares Cooking Equipment
21	Serves on "A" Line
22	Replenish Serving Lines
23	Serves on Short Order Line
31	Cleans Kitchen
32	Cleans Dining Room
33	Cleans Serving Line
34	Dishwashing
41	Receives Supplies
42	Maintains Supplies
43	Issue Supplies
50	Supervision
60	Administrative
71	Scheduled Breaks
72	Absent
73	Idle
74	Force Delay

TASK DEFINITIONS

10. FOOD PREPARATION:

11. Prepares for Cooking: Obtains ingredients. Opens food cans, boxes, pans, and/or bags. Places raw or pre-cooked items into appropriate cooking, heating, or serving containers. Cuts meats and vegetables. Mixes ingredients as required.

12. Cooks Food: Selects proper temperature settings, monitors food being cooked or rethermalized, and seasons food as required. Includes preparing eggs, hot cakes, french toast, meats, and other items on the serving line grill that are not immediately served to a customer. Removes ready food from cooking utensils and places in serving or replenishing containers.

13. Prepares Soups, Salads, Desserts, and Breads: Includes all productive time required to prepare soups, salads, and pre-baked desserts and breads and to transport items to serving line or tables.

14. Prepares Cooking Equipment: Includes all productive time required for obtaining and prelocating pots, pans, spatulas, and other cooking implements in preparation for cooking.

20. SERVING:

21. Serves on "A" Line: Cuts individual portions of meat on serving line. Serves patrons in line. Prepares utensils for serving.

22. Replenish Serving Line: Includes all time required to place, replenish, and remove food from the serving line and self-serve area. Makes beverages, refills milk coolers, ice cream freezers, and beverage dispensers.

23. Serves on Short-Order Line: Cooks and serves items such as steaks, hot dogs, hamburgers and other items directly from the grill to the customer. Includes time required for preparation of cooking and serving implements to be used on the short-order line.

30. DINING HALL SANITATION:

31. Cleans Kitchen: Cleans cooking utensils (pots, pans, etc.) and returns items to proper locations or receptacles. Cleans equipment and spaces (ranges, preparation tables, steam kettles, mixes, refrigerators, freezers, and dry storage areas, etc.). Sweeps and mops kitchen floor. Empties garbage cans and cleans garbage area.

32. Cleans Dining Room: Cleans tables, sweeps or vacuums floor, refills salt and pepper shakers and napkin dispensers.

33. Cleans Serving Line: Includes all productive time prior to, during, and after a meal expended in cleaning equipment and utensils on the serving line and in the self-serve area.

34. Dishwashing: Includes all time in the warewash function (washing, scraping, sorting, and transporting soiled and clean dishes to and from the warewash area). Includes time spent in start-up and shut-down of the warewashing equipment.

40. SUPPLIES:

41. Receives Supplies: Unloads all incoming supplies at the dock. Transports supplies to storage areas. Uncrates, unpacks, and stores supplies in appropriate locations.

42. Maintains Supplies: Repositions stored supplies to insure that longest stored items are used first.

43. Issues Supplies: Issues food supplies to cooks and records issues. Receives returned unused issues not used by cooks and annotates records indicating return.

50. SUPERVISION:

Inspects dining hall to assure cleanliness and maintenance of good sanitation practices; and gives or receives supervision.

60. ADMINISTRATIVE:

Drafts and types correspondence; prepares various forms for control records, maintains civilian employees personnel and pay records; maintains inventories and receipts for incoming food and expendable supplies. Inventories supplies after each meal, daily, and when directed by food service supervisory personnel. Buys out of stock items from other dining halls for immediate issue.

70. NON-PRODUCTIVE:

71. Scheduled Breaks: All time set aside for coffee breaks and meals.

72. Absent: Employee cannot be located in any work area.

73. Idle: Any time spent that is not work related (e.g., leaning on equipment and talking with others).

74. Forced Delay: Unavoidable delay, e.g., waiting for customers to arrive at serving line.

INTERVAL WORK SHEET

FACILITY _____

DATE _____

TIME _____

OBSERVER _____

TASK CATEGORIES

OBS TIME	11	12	13	14	21	22	23	31	32	33	34	41	42	43	50	60	71	72	73
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
Σ																			

APPENDIX C

B (C-1)

APPENDIX C

DATA COLLECTION FORMS

CENTRAL FOOD PREPARATION ACTIVITY

WORKER CATEGORY

CODE	CATEGORY
1	Supervisor, Military
2	Supervisor, Civilian
3	Cook, Military
4	Cook, Civilian
5	Baker, Civilian
6	Food Service Worker, Civilian
7	Warehouseman
8	Administrative
9	Other (Janitors)

TASK CATEGORY

CODE	CATEGORY
11	Ingredient Preparation
12	Entree Preparation
13	Dessert Preparation
21	Portioning
22	Packaging
23	Freezing
24	Packing
25	Storing
31	Sanitation, Equipment
32	Sanitation, Entree/Ingredient Preparation Spaces
33	Sanitation, Dessert Preparation Spaces
34	Sanitation, Storage Spaces/Other
41	Inventory/Maintenance
42	Shipping/Receiving
50	Supervision
60	Administrative
71	Scheduled Break
72	Absent
73	Idle

TASK DEFINITIONS

CENTRAL KITCHEN & INGREDIENT PREPARATION

10. FOOD PREPARATION:

11. Ingredient Preparation: Obtains raw ingredients; opens food cans, boxes and/or bags; cuts or slices meats and vegetables; mixes ingredients as required.

12. Entree Preparation: Obtains ingredients as required; places ingredients into cooking or heating equipment; selects proper cooking temperatures and monitors items being cooked; obtains required cooking implements.

13. Dessert Preparation: Obtains ingredients for baking as required; mixes and places ingredients into baking vessels; selects baking temperatures and monitors items while baking.

20. PREPARED ITEMS HANDLING:

21. Portioning: Cuts, places, ladles, etc., prepared items into portion size.

22. Packaging: Places portions into issue size containers, bags, etc.

23. Freezing: Places or removes items from quick freezer.

24. Packing: Places packaged items into shipping containers.

25. Storing: Places, packed or packaged items into storage areas (holding freezers/refrigerators).

30. SANITATION:

31. Sanitation Equipment: Cleans cooking or preparation equipment utensils, containers, etc.

32. Sanitation Entree/Ingredient Preparation Spaces:

33. Sanitation Dessert Preparation Spaces:

34. Sanitation Storage Spaces/Other:

40. SUPPLY:

41. Inventory/Maintenance: Inventories storage areas for quantities and conditions of items being held. Repositions stored supplies to insure that longest stored items are used first.

42. Shipping/Receiving: Loads or unloads items from or onto delivery vehicles either manually or with material handling equipment.

50. SUPERVISION:

Inspects CFPA areas to assure cleanliness and maintenance of good sanitation practices; and gives or receives supervision.

60. ADMINISTRATIVE:

Drafts and types correspondence; prepares various forms for control records and maintains employee work records.

70. NON-PRODUCTIVE:

71. Scheduled Break: All time set aside for coffee breaks and meals.

72. Absent: Employee cannot be located in any work or break area.

73. Idle: Any time spent that is not work related.

INTERVAL WORK SHEET

FACILITY _____

DATE _____

TIME _____

OBSERVER _____

TASK CATEGORIES

OBS TIME	11	12	13	21	22	23	24	25	31	32	33	34	41	42	50	60	71	72	73
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
Σ																			

APPENDIX D

B (D-1)

APPENDIX D

DATA COLLECTION FORMS

TROOP ISSUE SUPPORT ACTIVITY

WORKER CATEGORY

CODE	CATEGORY
1	Warehouseman, Foreman
2	Warehouseman
3	Motor Vehicle Operator

TASK CATEGORY

CODE	CATEGORY
11	Receiving/CFPF
12	Receiving/IP
13	Receiving/SDF
14	Receiving/Other
21	Warehouse Operation
31	Shipping/CFPF
32	Shipping/IP
33	Shipping/SDF
34	Shipping/Other
41	Transportation/CFPF
42	Transportation/IP
43	Transportation/SDF
50	Supervisory
60	Administrative
71	Scheduled Break
72	Absent
73	Idle

TISA TASK DEFINITIONS

10. RECEIVING:

Unloads items from delivery vehicles manually or with forklift truck. Task category used is by origin of items.

- 11. Receiving/CFPF: From Central Food Preparation Facility (CFPF).
- 12. Receiving/IP: From Ingredient Preparation (IP).
- 13. Receiving/SDF: From Satellite Dining Facilities (SDF).
- 14. Receiving/Other: From suppliers, Ft. Pickett, A.P. Hill, etc.) Note origin.

21. WAREHOUSE OPERATION:

Packs, unpacks, sorts, stacks, dunnages, bins and moves items, in-storage checks, internally tallies out stock. Operates forklift in handling warehoused items. Maintains cleanliness of warehouse spaces.

30. SHIPPING:

Loads items manually or with forklift onto delivery vehicles for shipment to approximate destinations.

- 31. Shipping/CFPF: To Central Food Preparation Facility (CFPF).
- 32. Shipping/IP: To Ingredient Preparation (IP).
- 33. Shipping/SDF: To Satellite Dining Facilities (SDF).
- 34. Shipping/Other: To Ft. Pickett, A.P. Hill, etc.

40. TRANSPORTATION:

Delivering subsistence and obtaining signed receipts. Transports subsistence to and from warehouses, CFPF, IPA, SDF.

- 41. Transportation/CFPF: To/from CFPF.
- 42. Transportation/IP: To/from IP.
- 43. Transportation/SDF: To/from SDF.

50. SUPERVISORY:

Supervises warehouse functions, checks safety, sanitary and security conditions, receives or gives supervision, inspects storage and subsistence.

60. ADMINISTRATIVE:

Receives subsistence documents; performs inventory, plans weekly and daily work schedules, reviews all incoming and outgoing shipping documents, verifies and tallies all subsistence received.

70. NON-PRODUCTIVE:

71. Scheduled Break: All time set aside for coffee breaks or meals.

72. Absent: Employee cannot be located in any work area.

73. Idle: Time spent that is not work related.

INTERVAL WORK SHEET

FACILITY _____

DATE _____

TIME _____

OBSERVER _____

TASK CATEGORIES

OBS TIME	11	12	13	14	21	22	23	31	32	33	34	41	42	43	50	60	71	72	73
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
Σ																			

ANNEX C

ANALYSIS OF SCIENTIFIC, TECHNOLOGICAL,
AND
ENGINEERING PARAMETERS OF CFPS
OPERATIONS METHODOLOGY AND PRACTICES

FOOD ENGINEERING LABORATORY

NARADCOM

ANALYSIS OF SCIENTIFIC, TECHNOLOGICAL,
AND ENGINEERING PARAMETERS
OF CFPS OPERATION
METHODOLOGY AND PRACTICES

FOOD ENGINEERING LABORATORY
US ARMY NATICK RESEARCH AND DEVELOPMENT COMMAND
OCTOBER 1978

Analysis of Scientific, Technological,
and Engineering Parameters
of CFPS Operation
Methodology and Practices

Food Engineering Laboratory
US Army Natick Research and Development Command

I. EXECUTIVE SUMMARY

Professionals of various food disciplines and from the Food Engineering Laboratory, US Army Natick Research & Development Command evaluated technical operations of the CFPS at Fort Lee, Virginia in the period March through August 1978. The evaluation was conducted by on-site visits and by analyzing reports produced in the course of CFPS operations.

At no time during the evaluation was the CFPF in a production mode, but rather always in a kitchen mode. From this it followed that the personnel savings, material savings, and product quality benefits envisioned in developing CFPS could not be realized to anywhere near the extent deemed possible in the original development work. As a corollary and probably a part of the "kitchen syndrome", quality control as opposed to quality assurance was practically nonexistent.

Serious problems existed in the dining halls that appeared to occur because of a lack of training and motivation in the new system. These problems tended to be overcome as operating personnel gained experience with the system. However, the dining halls were being operated without the level of technical help, quality control, and central direction originally envisioned under the CFPS concept. Indirect evidence, such as nonuse of CFPF products, unbalanced menu, etc., suggested that dining hall staffing might be excessive.

It was concluded that from a technical standpoint, the CFPS as operated during the evaluation period was not representative of CFPS as originally conceived nor was it at any time in a steady state. Therefore, any evaluation results refer only to a transient, nonrepresentative system.

II. INTRODUCTION

This part of the CFPS evaluation was conducted by the Food Engineering Laboratory (FEL) of the US Army Natick Research and Development Command (NARADCOM). It involved staff members with expertise and experience in applicable food disciplines such as food technologists, engineers,

dieticians, home economists, packaging technologists, equipment technologists, etc. Included were personnel with extended commercial experience in production and quality control as well as personnel more oriented toward R&D. A total of 20 staff members were involved in a major way.

The evaluation was carried out in consonant with Evaluation Plan Central Food Preparation System, Fort Lee, Virginia dated 27 February 1978 and prepared by US Army Troop Support Agency, Fort Lee, Virginia. Responsibilities of FEL are outlined in Section III, page 9. Conduct of the evaluation is given in Section IV, page 13. A detailed FEL evaluation plan entitled Analysis of Scientific, Technological, and Engineering Parameters of CFPS Operations Methodology and Practices is given in Annex G.

III. CONDUCT OF THE EVALUATION

A. Purpose

The basic evaluation of CFPS is to be on its overall cost and the quality of food served in comparison with the standard dining hall system. However, CFPS is exceedingly complex and made up of so many diversified components that the basic evaluation could be made of a system which might be entirely different from original design. In order to evaluate the system from technical and engineering standpoints, FEL undertook to analyse the operations using professionals in the various food areas. This analysis was designed to:

1. determine the operating characteristic of the Interim CFPS as they existed during the evaluation period and where they varied from original design and/or accepted good practice.
2. supply data for the economic analysis.
3. supply information to permit adjustment of other evaluation efforts.

B. Discussion

There are several ways by which the internal workings of an operation can be examined and evaluated. The two methods chosen in this case were examination of records produced by the operation itself and on-site visits by experts in various areas. The information from each method can be broken down into hard data and soft data. Generally speaking, hard data can be considered as facts and figures while soft data as deductions from a set of circumstances or opinions.

Hard data are specific, objective, and quantified although wrong conclusions can be drawn unless proper precautions are taken. Soft data are subjective and thus value depends mostly on the qualifications of the persons generating them. Both types of data are necessary for the evaluation of CFPS. A large amount of data has been generated by FEL, particularly of soft data, which is very like pieces of a large jigsaw puzzle which have to be meshed with each other.

C. Methodology

Production reports available for FEL evaluation were dining hall head counts, weights of various entree items shipped by TISA to the dining halls, production yield reports, and 42-day cyclic menus. These reports were compared and analyzed to develop a picture of the operations.

A total of 38 separate TDY trips were made to Fort Lee by various professional members of FEL staff. Instructions to these persons were that they were to examine thoroughly the areas of their particular expertise, to examine other areas of the operation as time permitted, and to write extremely detailed MFR's in addition to their normal trip reports. In some cases, technologists were requested to give technical assistance on a particular problem and this was not considered part of the evaluation. In cases where the evaluation uncovered problems and deficiencies for which help was requested in correction efforts, before and after conditions are reported as part of the evaluation.

Information from all sources was collected, collated, and analyzed. From this, the overall FEL Evaluation Report was developed. Where possible, the validity of the data was checked through other sources of similar data.

A separate study was made to compare energy usage of the CFPS against the standard dining hall system. Specific methodology for this study is given in Chapter IV.

IV. OBSERVATIONS AND FINDINGS

A. General Operating Characteristics, CFPF

1. Purpose: To compare general operating characteristics of the CFPF with recognized good practices.

2. Discussion: The CFPF concept departs from traditional Army food service practice in that it is designed to be in a food production mode rather than the kitchen mode of a standard dining hall. In both modes, food is prepared for serving with formulations or recipes being very similar. Where the two modes differ is in the philosophy and practice of operations. The

differences seem small to the uninitiated, but spell success or failure of the operation.

In the kitchen mode one man (the cook) starts out with raw materials and personally goes through or personally supervises all preparation steps to the final product ready for serving. In many cases he actually helps with the serving and is in quite close contact with his customers. He is directly responsible under the dining hall steward to make sure all customers are fed with one product or an equivalent, that the food quality is at the desired level, and that health and safety of the customers are protected through proper sanitation and adherence to standard safe practices. His work is almost entirely menu and meal time driven.

In the production mode, no one cook or production worker of any kind is charged with complete responsibility from raw material to consumer's plate. Instead, each worker is charged with only a small segment of the overall effort. It is extremely difficult for him to develop any great interest or pride in any other part of the operation and he probably will do things like accepting material from another section without questioning its quality or quantity, etc. Because of this difference, staff and line control operations become entirely different in a production mode. If they are not performed correctly in the CFPP, the operation will at the very least fail to perform up to expectations and probably will be inferior to the traditional kitchen in both costs and food quality. This work is divorced from menu and meal time. It is driven by efficiency of operations.

One of the fallacies commonly encountered with food service is that it is so simple anyone can do it. Actually a food service system is as complicated as a weapons system and will not function properly without personnel training. If proliferation is to be done without training and experienced management, it is doomed to failure. A refusal to recognize the critical difference between dining hall and production modes and a refusal to supply management trained in production techniques will make operation of a CFPS uneconomic and slanted toward poor food quality.

3. Evaluation Results: Almost no one in the CFPS understood the difference between the kitchen mode and production mode. Their total experience was in the kitchen mode. Therefore, CFPP was being operated as though it was in the kitchen mode even though the food was prepared either frozen or chilled for serving at a later time. Evidence of this is as follows:

- Small lot sizes
- Widely varying yields which indicates an inattention to yields
- Short time between runs of the same product (Fig 1) (see IV, B,2)
- Lack of floor quality control indicating complete dependence upon individual workers (cooks) for quality control
- Trip reports by experienced technologists

4. Conclusions:

a. Since the CFPP has been operating in the kitchen mode, any evaluation of the operation is suspect as a true picture of how CFPP could operate.

b. Operation of the Interim CFPP confirms that without professional production management CFPS cannot be expected to reach its objectives of low costs and high food quality.

c. Unless the decision is made to supply professional production management and personnel training in proliferated CFPP's, the systems will fail in their objectives.

B. Internal Operations, CFPP

1. Purpose: To determine if the CFPP was operating according to good practices to optimize costs and quality considering resources available.

2. Discussion: It has been pointed out under General Operating Characteristics, CFPP that the CFPP should be operating in a production mode rather than a kitchen mode. This is a "way of life" or "way of thinking" that the operators and managers must have. In essence, it calls for making a product

a. with the desired or mandated quality

b. as fast as possible

c. at the least possible cost

Of course, these points are true to a degree when in the kitchen mode, but they are vitally important in the production mode. This part of the evaluation is concerned with them as the day to day operations of the CFPP infringe on their optimization.

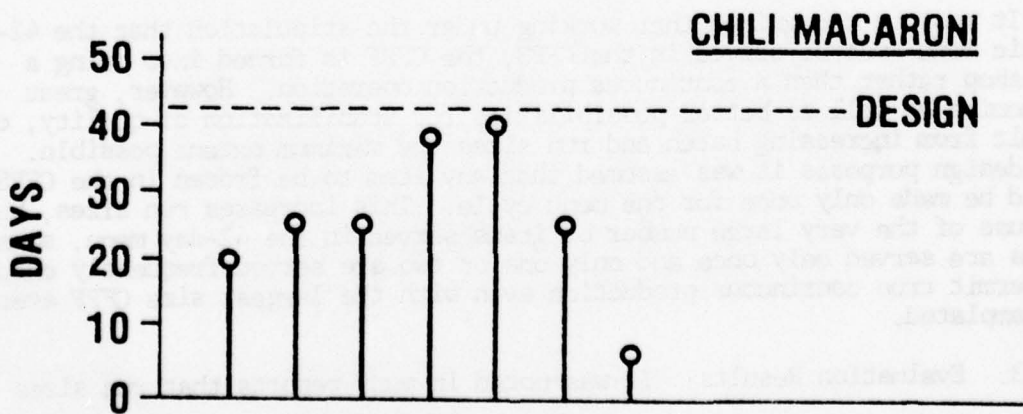
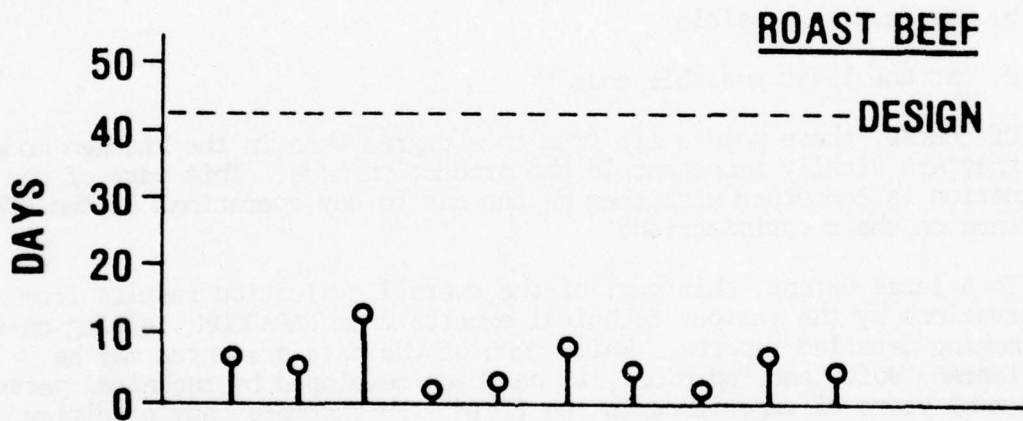
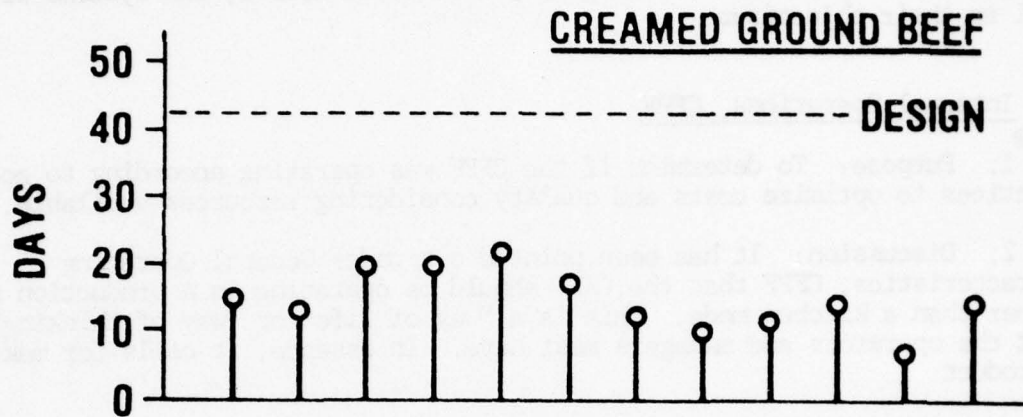
To a large extent, this part of the overall evaluation results from observations by the various technical experts from NARADCOM visiting on-site and making detailed reports. While much of the data presented may be considered "soft" and "opinion", it has been developed by technical personnel with many years of experience in the field. Furthermore, any condition reported only once by only one person is considered an isolated aberration.

It must be recognized that working under the stipulation that the 42-day cyclic menu must be served in the CFPS, the CFPP is forced into being a job shop rather than a continuous production operation. However, great economies as well as better possibilities for stabilization of quality, can result from increasing batch and run sizes the maximum extent possible. For design purposes it was assumed that any item to be frozen in the CFPS would be made only once for one menu cycle. This increases run sizes, but because of the very large number of items served in the 42-day menu, some items are served only once and only one or two are served frequently enough to permit true continuous production even with the largest size CFPP ever contemplated.

3. Evaluation Results: It was noted in many reports that run sizes

FIG 1

**CFPF
REPORTED PRODUCTION SCHEDULING
IN DAYS BETWEEN RUNS**



of all products were small which negated the supposed advantages of CFPF. In order to determine if this was due to the small number of meals served at Fort Lee or to improper scheduling, production dates for the principal entree items were determined from DFM records. Results for three typical products are shown as days between runs in Fig 1. The dotted line labeled "Design" is 42 days. The vertical lines are days between successive runs and intervals on the horizontal axis have no significance. Chili Macaroni has the greatest time span between runs, but this is because it is served infrequently. Generally, entree items are made much too frequently, which results in lot sizes of 800 to 2500 portions or 400 to 1200 pounds. This is not a CFPF operation, but essentially a little over a large dining hall.

It follows from the above that hand labor was excessive as reported by many observers. Automatic equipment was not used since man hours of cleaning would be excessive for the results accomplished (IV, H, I). In some cases it seemed that automatic equipment suitable for the job at hand was not used more from habit than anything else.

For whatever the reasons, the operation of CFPF seemed to be almost identical with a large kitchen rather than trending to the assembly line configuration of a pure production mode (IV, A). This extended to utilization of personnel with the crew floating through the whole process rather than individuals concentrating on one or two specialized tasks.

In July when Mr. Scott and SFC Lyons of FEL spent a week investigating yields (IV, F), they reported in essence that the production personnel were not particularly concerned with quality and very often used materials they received without adjusting for discrepancies.

At the time of their second visit in August, this was turned around and production personnel were very conscious of their role in maintaining quality. This did not solve the problem completely, but it was a big improvement.

4. Conclusions:

a. Small lot sizes were one of the principal manifestations of the CFPF being operated in the dining hall mode.

b. Improvements were made in operations but the CFPF was far from being an ideal production facility.

C. Internal Operations - Satellite Dining Halls

1. Purpose: To compare general operating characteristics of the satellite dining halls with recognized good practices.

2. Discussion: Dining halls in a CFPS essentially are operated as they would be in their normal mode. Differences are found primarily in the

way the food is handled, prepared, and served. This means that the kitchen personnel must be trained in new techniques. Furthermore, it is rare that frozen foods are or can be garnished before freezing. This should be done in the kitchen if the foods are to have their true customer appeal.

In the planning stages of CFPS it was considered that the dining halls would have to be under some kind of central control if the system was to operate properly. From this control would stem training in handling, reconstituting, display, and "merchandising" of food; standardization of practices; provision for strong quality control; binding the CFPF and dining halls together as a food service team.

While one of the parameters of CFPS has been that the 42-day cyclic menu would be used during the planning and test stages, it has been recognized that CFPS was not considered during planning of this menu. Therefore, no consideration was given to matching central prepared with dining hall prepared foods to even out the workload in the dining halls from meal to meal. A casual examination of any of the 42-day cycles will show this. Therefore, if dining hall staffing is to be at a minimum, yet operate effectively, the menu must be adjusted. For example, considering only entree items at lunch and dinner, taking at random two weeks beginning 16 July, the mix is shown in Table 1.

TABLE 1

Basic Preparation of Menu Items
42-Day Cyclic Menu

	Lunch		Dinner	
	CFPF	DH	CFPF	DH
16 July	0	2	2	0
17 July	0	2	0	1
18 July	0	2	2	0
19 July	0	2	1	1
20 July	2	0	1	1
21 July	1	1	1	1
22 July	1	1	1	1
23 July	1	1	1	1
24 July	2	0	1	1
25 July	1	1	0	1
26 July	1	1	1	1
27 July	2	0	0	2
28 July	1	1	2	0
29 July	1	1	2	0

Dining hall staffing will have to be such that the heaviest workload can be handled. Examination of the menu indicates that it could be adjusted by shuffling products with little effort to even out the workload without

affecting the acceptability.

3. Evaluation Results: Consistent reports from technologists and dieticians visiting the dining halls on evaluation trips, indicated that there were serious negative attitude and morale problems with the operating personnel that seriously affected their performances. These reports were based on informal conversations with key personnel in the dining halls. Formal surveys should confirm the attitudes shown. Very definite improvements were noted during the course of the evaluation period, but there was no question in observer's minds that these problems had serious adverse effects on the quality of food and food service from a technical standpoint and which should show up in other evaluation studies.

Reports on visits made during April and May indicated serious problems in SOPs' and operating guides not being followed so that food quality was very poor in many cases, limited variety, too many leftovers, etc. While there were problems in all dining halls, some facilities were much worse than others. Reports in June began to indicate very definite improvements, although many problems still existed.

As far as could be determined, the menu was not completely adjusted to minimize workload, although it was stated that the Menu Board was making efforts in this direction. However, the issue was confused in actual dining hall situations by the leftovers being served most of the time.

A study of the frozen entree shipments to the individual dining halls, the menus, and the reported head counts indicated the dining halls were not ordering enough product to meet their headcounts. The statistic used was called "missing meal factor" or MMF where

$$\text{MMF} = 100 \times \frac{\text{Portions Shipped} - (\text{Menu requirements} \times \text{adjusted headcounts})}{\text{Adjusted Headcount}}$$

The adjusted headcount took into account short order and such factors. MMF for April was 18.3 percent, for May 15.7 percent, for June 1.0 percent. These figures indicated that for April and May, the dining halls were not using as much CFPF products as they should have been. Where they found the labor and raw materials to prepare this additional food is not shown on records available to FEL. However, the June figure of 1.0 percent (which is really the equivalent of 0 percent) shows what can be done when a problem is called to the attention of management and a determined effort is made to solve it.

4. Conclusions:

a. Morale and attitude problems with operating personnel caused severe food quality problems during the evaluation period.

b. The dining halls were being operated without the level of technical help, quality control, and central direction originally envisioned under the CFPS concept.

c. Improvements in operations indicate that the evaluation was being conducted too early and before the operation was in a steady state.

d. More thought and planning must be given to the menu so that the dining hall workload is evened out while maintaining the product mix directed by management.

e. Any evaluations made on costs and quality during the period of the evaluation, must be highly suspect unless meaningful factoring out of improper operations can be accomplished.

f. While this study gave no direct indications as to dining hall staffing, it does suggest that it has not been "bare bones" at least during noon and evening meals.

D. Personnel

1. Purpose: To determine if management and operating personnel had the training and experience to operate the CFPS properly.

2. Discussion: One of the most difficult concepts to explain to persons who have not had first hand, hands on experience in food processing operations is that it is a different world from running a dining hall. The difficulty lies in that the differences are a "thousand" little things, seemingly insignificant in themselves, that add up to success or failure of the operation. Production supervision is a skill which can be learned only by doing for the most part. Very seldom can it be learned by just observing and some people never can get the hang of it. It is practically unheard of in industry for a person to step directly into a key production position without prior relevant experience no matter how many degrees he has after his name or how many times he had walked through the plant. Management, on the other hand, does not have to have the direct hands on experience, although such experiences cannot but help and most firms have management training programs which include production duties.

In contrast to supervision, the CFPS workers including cooks should be quite adaptable to processing operations although they will need some instruction, on-the-job training, and motivation. The new things they will have to face are basically much larger run sizes, more use of automatic equipment, more team work, stricter controls, and freedom from three meals a day constraints.

Most dining hall workers under CFPS do not need quite the same skill levels as would be needed under the standard system since much of the cooking will be done for them. However, the management and key cooks must be skilled. In addition, all personnel must be indoctrinated and trained to handle the new system since the prepared foods can be ruined by improper handling. On the other hand, they can be made much more appetizing by proper handling, garnishing, etc.

3. Evaluation Results: One comment overheard and reported several times was to the effect that no training was conducted with dining hall personnel since this is the way it would be "thrown" at the operators in any proliferation. The disastrous effect of this lack of training combined with poor morale and motivation had on operations showed up in every trip report for at least the first two months of operations and continued on to some degree throughout the entire evaluation period.

They were few, if any, adverse comments on the workers in CFPF. They seemed to have whatever skills that were necessary and to be doing their jobs as directed.

Comments made by senior FEL staff members on management and supervision of CFPS production operations were to the effect that there was no one in the organization with the requisite production type experience to insure a smoothly run, successful production operations. The operation was run in the dining hall mode because this was the background of the personnel concerned. FEL evaluation personnel invariably reported that the CFPS personnel they had contact with were courteous, extremely helpful, and almost certain to be very capable in their own specialities.

4. Conclusions:

- a. Training of personnel was inadequate.
- b. Management and supervisory personnel were not experienced or trained in production mode operations.
- c. Selection of key personnel and training must be improved drastically for success of any proliferation.

E. Control of Product Quality

1. Purpose: To determine if product quality is being controlled from raw material to consumers' plate at as high a level as feasible with generally recognized good quality control and quality assurance practices.

2. Discussion: R&D conducted by NARADCOM on cook-freeze systems, current literature, and generally accepted practice all indicate that CFPS provides an excellent opportunity to maintain food quality at a uniformly high level. It will not be a "gourmet level", but neither does it have to be mediocre. Many tests indicate that frozen food properly designed and produced, can be of excellent quality. CFPS provides the opportunity to have the most skilled cooks doing the critical cooking operations. It also provides the opportunity to have an industrial type quality control operation.

The control of product quality in any manufacturing operation must be the responsibility of the production personnel since they are doing the

work and must not be freed from responsibility for the results of that work. However, since quality and control of quality are so important, there must be a formal staff organization whose responsibility it is to help production in the control of product quality. In CFPF this is the Technical Support Office.

Control of quality is divided into two main functions - Quality Control (QC) and Quality Assurance (QA). QC is the minute by minute, hour by hour, day by day, checking of all things that might affect quality from the raw materials through sanitation and adherence to specifications, to a final look as the finished product goes out the door or, in the case of CFPF, goes on the customer's plate. Statistical Quality Control (SQC) has been shown to be one of the most powerful tools ever invented to control quality. However, it would be applicable only in a very limited way, to the Fort Lee CFPF because it is a job shop too small for SQC to be effective. Therefore, QC in this operation should be one or more intelligent and knowledgeable persons whose continuous and sole job is to check conditions and practices in the operations against specifications, SOPs', general instructions, operation guides, and good practice standards.

QA is the checking of the final product as it goes out the door or as it is received by the customer to make sure the quality is at designated level. In an internal operation, it is also testing to make sure that SOPs' etc., such as for cleaning procedures, are producing the desired results. It is almost always done on a statistically chosen sample, rather than by 100 percent inspection. One of the best examples of QA is in the statistically chosen samples from meats offered under contract to the Armed Services and inspected on the basis of end product criteria.

3. Evaluation Results: All of the evidence gathered, indicated that QC was not being performed in such a way as to be effective. QA, on the other hand, was being pursued in most areas with some effectiveness.

Several reports and in particular those by the most senior technologists, stated flatly that no "floor" QC was observed. Examination of product yield figures (IV, F) showed that there were wide fluctuations in yields of entree items which indicates that the QC job was not being done in controlling quality. Individual reports of instances of poor quality, extremely variable quality, nonconformance with SOPs' and production guides, poor operational practices, etc. were so numerous that there could be no other answer but that product quality was not being controlled.

QA was being performed very well in sanitation and product safety areas (microbiology). A formal taste panel was in operation. However, it was apparent that any results it reported were not being translated into effective QC action.

4. Conclusions:

- a. Control of product quality was being performed very poorly,

particularly in the QC area.

F. Product Yields - CFPF

1. Purpose: To determine the consistency of yields, how they compare with standard and theoretical yields, and to relate yields to operational quality and efficiency.

2. Discussion: One of the most important indicators of an operation's quality and efficiency is product yields. With food products it is generally accepted that yields will be increased around 15 percent when the operation is changed from a small kitchen-type to a large commercial-type. Thus, the yield becomes a big factor in relative food costs. Furthermore, variation of yields from run to run is a very good indication of how well the operation is controlled. It is an important indicator as to the efficiency of the quality control operation both in maintaining the desired quality level and the cost levels. For purposes of this study only entree item yields were investigated rather than trying to look at all yields.

3. Evaluation Results: Generally, all yields looked at displayed the same characteristics. In Fig 2, percent variation from theoretical yields are shown for three products. These products are fairly typical of all entrees and had been made enough times to provide valid comparisons. The yields are in time sequence on the horizontal axis which has no dimensions. Excluded are yields against which there were notations that indicated yields probably were not typical. Disregarding the one "odd ball" in Creamed Ground Beef and the one in Roast Beef the variations in the three products are shown in Table 2.

TABLE 2

Variation in Yields From Theoretical

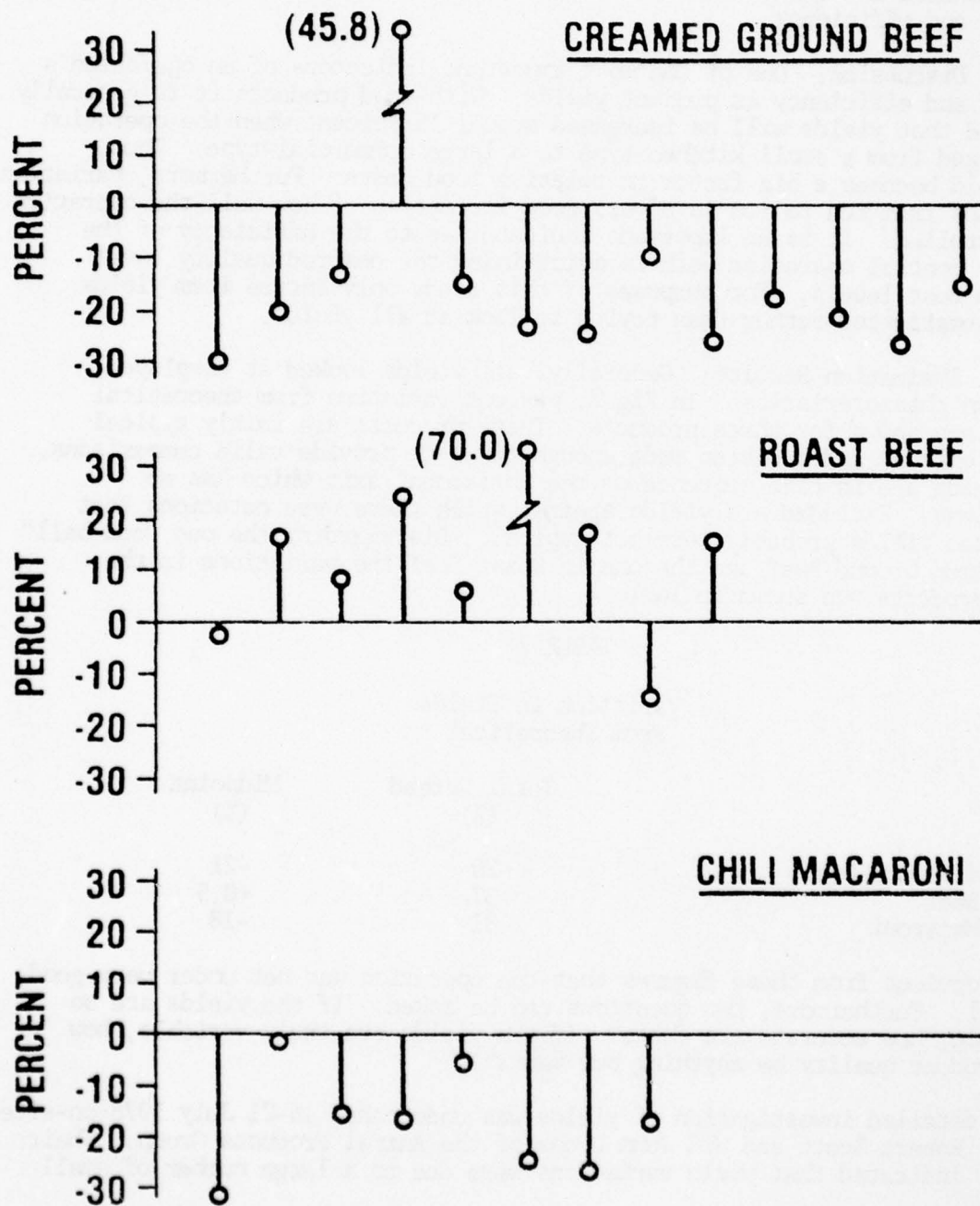
	Total Spread (%)	Midpoint (%)
Creamed Ground Beef	20	-21
Roast Beef	37	+8.5
Chili Macaroni	31	-18

It is obvious from these figures that the operation was not under very good control. Furthermore, two questions can be asked. If the yields are so variable, how accurate are costs? If the yields are truly variable, how can product quality be anything but variable?

A detailed investigation of yields was undertaken 16-21 July 1978 on-site by Mr. Robert Scott and SFC John Lyons of the Animal Products Group. Their report indicated that yield variations were due to a large number of small

FIG 2

CFPF
VARIANCE OF REPORTED PRODUCTION
YIELDS FROM THEORETICAL
[SEQUENTIAL]



factors in raw materials, issue, ingredient preparation, and production most of which should have been caught and corrections forced by quality control and first line supervision. Both Scott and Lyons stated that in their opinion, the operation was being run in a kitchen mode rather than a production mode and, with a lack of floor quality control, this indirectly resulted in the yield variances.

In order to develop more reliable information on the yields which can be expected if the Operational Guides are followed exactly and tight control is exercised over production, Mr. Scott and SFC Lyons spent two weeks (20 Aug - 1 Sep 1978) with Mr. R. Helmer of TSA following entree items from raw material to frozen product. Their report shows a complete turn around on the part of production personnel and excellent results being obtained. However, the quality control function was not being performed and some changes were pointed out as necessary in the methods of keeping records.

4. Conclusions:

a. Yields reported until the time of the Scott & Lyons visits indicate the system was not under control. Therefore, costs, quality, and personnel usage during the period up to that time (21 Jul 78) are highly suspect and any evaluation studies on these parameters also must be highly suspect unless a meaningful factoring out of this control lack can be accomplished.

b. Control of the operation after the Scott & Lyon visits will depend upon continued management attention.

c. Quality control has not functioned properly (IV, E).

G. Product Mix - CFPS

1. Purpose: To investigate the theoretical CFPS product mix to determine the optimum make centrally, make dining hall, or buy commercial combination.

2. Discussion: All of the planning, experimentation, and evaluation of CFPS until sometime in FY78 based products to be produced in CFPP on three basic criteria. These were:

a. The regular 42-day cyclic menu would be used with no substitutions dictated by CFPS.

b. Only products in the Federal Stock Catalogue Supply List and authorized for issue in the standard feeding system would be used except for certain special products such as modified starch dictated by the cook-freeze system and larger size containers.

c. Decisions as to which products should be made in CFPP would be based first on quality of the finished product (essentially as good as or better than the average dining hall prepared) and second on cost considering both raw materials and labor.

Using these three criteria, the product mix for CFPS is established almost automatically. Any one of the 42-day cyclic menus will work out to be about 60 percent fully or partially prepared centrally.

The TSA Evaluation Plan, Central Food Preparation System, Fort Lee, VA dated 28 February 1978, contained a task listed as the joint responsibility of FEL and TSA to assess the impact of the 42-day cyclic menu in CFPS. This was later construed to include a make or buy study.

The initial FEL effort in this study was to develop possible menus containing 80 and 100 percent CFPF prepared or other convenience items with the dining hall work on these items being limited to heating if required, garnishing, and serving. The task was assigned to the Experimental Kitchen Branch. Expansion of the task to determine a theoretical CFPS product mix based only on quality and cost was assigned to two food technologists. Unfortunately, time restraints limited the overall study to a survey of representative products and quality could not be examined in detail.

It should be pointed out that in the past, the introduction of convenience items into the Army garrison feeding system has been piecemeal and tended to follow Parkinson's Law (work expands to fill the time available) so that the end result has been no labor saved. Therefore, as a practical matter, the introduction of Tray Pack into the present system on a piecemeal basis would result in no personnel savings. Based on the experience with the present CFPF at Fort Lee, the personnel savings if Tray Pack were introduced as a complete system would exist, but probably be minimal. However, for the purposes of this study, it is assumed that Tray Pack is introduced as a system and that the cost of handling, reconstituting, and serving in the dining hall would be the same as for CFPF foods.

The product mix study covered only 10 individual representative items produced in CFPF. For this reason, and because costs were based on theoretical optimum staffing, they cannot be related directly to the economic study included in this overall evaluation report by OR/SA. Furthermore, since it was necessary to make so many assumptions due to the lack of time to obtain hard data, results should be considered approximate and the study a dry run for a larger effort.

The study was restricted to CFPS and regular feeding system as now constituted. This eliminated such things as an overall evaluation of convenience items now in the system, ingredients more in line with current production practices rather than in dining halls, etc. The basic economic factors were adapted from a report by Mark Davis and John Rogozenski of OR/SA dated 26 September 1972, entitled "Economic Analysis for the Proposed CFPF System at Fort Lee, VA", adjusted for inflation. Values used are theoretical.

3. Evaluation Results: It is very evident that the 42-day menu as it now exists, is not designed with CFPS in mind. Furthermore, the products listed in the Federal Supply Catalogue to support this menu have been set

up for dining hall use and dining hall operation mode rather than for a CFPF in a production mode. In addition to these points, the basic operating parameters for the CFPS such as container type for the product, make-or-buy mix, etc., could be changed in accord with newer state-of-the-art to the advantage of CFPS.

The basic factors about the 42-day menu and the Federal Stock Catalogue that affect the efficiency of CFPS are:

- a. Items prepared centrally are not necessarily set up in combination with dining hall prepared to equalize the dining hall workload.
- b. Container sizes are designed for small batch sizes.
- c. Mixes, partially prepared items etc., are used, although as far as is known, no study was made as to making these products in CFPF.
- d. The menu as a whole contains so many items that any one item can only be made in comparatively small lots even though it is served a number of times. A number of items will only be served once in the cycle.
- e. The menu was not made up to maximize CFPF production volume by increasing the number of centrally prepared items.

The results of the product mix study are shown in Table 3. Dining hall costs were allocated to specific food classifications and this figure added to material cost into the dining hall. The figure used for the commercial products was the same as for the CFPF products since it could be considered that they required the same amount of preparation effort.

Tray Pack products cost more than CFPF, but less than commercial frozen or dining facility. No. 10 can products are the cheapest, but generally speaking, their quality is distinctly under the other products. However, quality distinctions are made in this part of the report.

4. Conclusions:

- a. Efficiency and product costs in CFPS can be improved greatly by adjustments in the menu used.
- b. The work on product mix in the A-ration should be continued and expanded independently of CFPS. The end result should be a clear picture of the impact on the system of convenience items, the possibilities of including partial or complete systems incorporating new state-of-the art products such as thermally processed tray packs, and where further research can pay off in both the near and far terms.

H. Equipment

1. Purpose: To determine suitability, usability and usage of equipment

TABLE 3

Comparison of Individual Portion Cost Estimates for Prepared Selected Master Menu Components in the
DF and CFPF Versus Cost of Commercially Prepared Counterparts

Total Cost per Portion					
Menu Components	Dining Facility	Central Food Preparation	Commercial Counterpart 1/ Tray-Heat Processed Tray-Frozen	No. 10 Can	
<u>Entrées</u>					
Beef Stew	0.982	0.727	0.822	0.902	0.538
Sliced Roast Pork w/Gravy	1.322	1.025	1.292	1.392	0.727
Oven Fried Chicken	1.039	0.779	2/ 2/	0.781	2/ 2/
Meat Loaf	1.006	0.740	2/ 2/	0.902	2/ 2/
<u>Vegetables</u>					
Cauliflower Au Gratin	0.368	0.266	0.352 4/ 0.314 4/	0.383	2/ 2/
Potato Au Gratin	0.337	0.250		0.342	2/ 2/
<u>Desserts</u>					
Yellow Cake Plain	0.375	0.263	2/ 2/	0.256	2/ 2/
Apple Pie	0.485	0.322	2/ 2/	0.269	2/ 2/
Chocolate Chip Cookies	0.394	0.262	2/ 2/	0.197 3/ 0.167 3/	2/ 2/
Sugar Cookies	0.371	0.260			2/ 2/

81-5

1/ Counterpart menu components include appropriate allocated Satellite Dining Facility operation costs.

2/ Not commercially available

3/ Fresh

4/ Estimate

in the CFPF and dining halls.

2. Discussion: Dining halls are designed to prepare food from scratch. This is true even though more and more so-called convenience foods have been added to the authorized raw materials. With a CFPS, some of the basic equipment is no longer needed in the dining halls while additional equipment such as freezers and means for reconstitution must be added. The CFPF is, or should be, designed and equipped to prepare foods in a production mode using production type equipment and methods as far as possible.

In the original design work, the CFPF at Fort Lee was set up with equipment larger in size than would be needed for the expected production volume. This was done to operate equipment which would be used in the larger facilities and to provide for training.

This part of the evaluation is to determine how far the equipment and its operation deviate from what would be considered optimum.

3. Evaluation Results: Table 4 gives observed equipment usage time for two separate weeks. It is very evident that the equipment was underutilized to such a degree that the facility was running at a small fraction of its true capacity if freezing capacity is excepted. Part of this is due to the original design calling for oversized equipment to be used for training purposes. However, the pattern of usage could have been improved if the facility had been in a production mode where there would be much longer times between runs.

The blast freezer is the controlling factor in determining total CFPF capacity in the Fort Lee facility. It was designed to reduce the temperature of 1000 pounds of typical entree items from 180°F to 0°F in 1½ hours. This has never been checked out. It would have to be and the whole freezing operation evaluated from scheduling to the actual temperature drop needed if the true capacity of the facility were to be determined.

Generally speaking, the equipment seemed to be adequate and to be operating properly with exception of the breader and the roll-in ovens (Despatch). The breader was the wrong type to do a complete breading job so that breading had to be done by hand. A new breader was on order, but not yet received. The roll-in ovens gave continual trouble in not providing uniform heating even though a factory representative was called in to adjust them and to install new perforated heat flow panels. From a product quality standpoint they are not as satisfactory as the rotary ovens although their usability and capacity are better.

Maintenance of equipment appeared to be very good. Problems encountered were mainly the type that could be expected in any new operation.

Complaints were voiced that there was insufficient equipment in the dining halls to reconstitute the volume of frozen products needed for the meals. Some of this was noted by FEL personnel. However, it would require an indepth study to analyze the situation properly since it was made very complex by the menu set-up, product scheduling, etc. Theoretically, the equipment available was adequate. The way the system was operating, it was not.

Automatic and semiautomatic equipment was, to a large extent, not used in favor of hand labor, even though it was at hand and in operating condition. The common excuse offered was that the lot sizes were too small and would not justify the labor and cleanup involved with equipment. In many cases, this was a valid excuse if the small lot sizes could be accepted as valid in the first place (see IV, F). In other cases, however, the excuse was considered invalid and the nonuse of equipment due more to the prevailing dining hall operational mode.

The nonuse of equipment was particularly prevalent in the packaging operations. For example, a detailed report by a packaging technologist showed ten persons being used for hand functions in the bakery packaging operation. This could be reduced to three using the automatic Raque packaging line. The same was true of the entree packaging, where ten persons were used instead of three. The unloading operation of the freezer used ten persons, whereas this would be reduced to five persons if the automatic mode of the Baker-Perkins freezer was used.

Certain pieces of packaging related equipment were not available. A PurePak machine would automatically fill and seal milk cartons with soups, sauces, and gravies. It was not available and soups were observed being filled by hand dipping into aluminum $\frac{1}{2}$ steam table disposable pans. This is extremely wasteful of materials and labor as well as providing a package awkward to handle. Equipment for the old system for entrees which was displaced by the disposable aluminum pans (IV, I) would not save any appreciable direct labor over the system for aluminum pans (which was not being used).

4. Conclusions:

- a. Underutilization of equipment was so pronounced that it was almost impossible to evaluate it.
- b. Available automatic equipment was used minimally.
- c. Dining hall equipment should be reevaluated if CFPS is proliferated.

I. Packaging

1. Purpose: To determine if the CFPS was using the most cost efficient packaging considering present state-of-the-art.

2. Discussion: If food products are prepared for use at a later date, they must be packaged in some way to protect them from outside contamination and to provide a means by which they may be stored, transported, and prepared for serving. The elaborateness and sturdiness of the container system will depend upon the conditions to which it will be subjected. Generally, cost of the containers and packaging materials will parallel the amount of protection needed, but convenience and operating factors will also affect it.

TABLE 4
CFPF Equipment Usage

Equipment	Weekly Hours of Operation			
	12-16 June 1978		28 Aug - 1 Sep 1978	
	Max/Day	Total	Max/Day	Total
Cutter, Cookie (1)	---	---	0.75	1.5
Depositer, Cake (1)	1.0	1.75	1.0	1.0
Depositer, Cookie (1)	2.0	4.0	---	---
Doughnut Machine (1)	4.0	4.0	4.0	8.0
Fryer, Continuous (1)	1.1	2.3	3.5	11.7
Fryer, Tilt (2)	1.25	2.67	---	---
Kettles	7.0	22.25	6.0	12.0
fixer (1)	1.0	3.75	1.0	5.0
Oven, Revolving (2)	5.5	13.5	5.75	17.25
Oven, Roll-In (2)	4.75	10.75	4.1	9.6
Pie Machine (1)	2.0	2.0	---	---

Adapted from trip reports of two equipment engineers

In the original design of CFPS, very careful consideration was given to packaging and packages as part of the total system. However, in development of the Interim CFPS at Fort Lee it was deemed necessary to make certain changes due to convenience and physical layout of the CFPS.

3. Evaluation Results: The original design for packaging entrees was freeze them in a flexible mold slightly smaller than a $\frac{1}{2}$ steam table pan, remove the frozen block from the mold, and wrap it with a suitable film using an automatic bread wrapping machine. The frozen blocks would be placed in stainless steel pans for reconstitution. Currently, disposable aluminum pans are used. The main advantages of the disposable pans are convenience and no washing of used molds and reconstitution pans. The main disadvantages are considerable waste volume in shipping and storage and an increased direct cost of approximately three cents per serving.

The original design packaging of soups, gravies, and sauces was the PurePak (paper milk carton) type. However, instead of this system, these products were placed in aluminum $\frac{1}{2}$ steam table pans. With single strength soups, the increased direct container cost is approximately two cents per serving.

The primary observation on packaging in the bakery area was that almost no automatic equipment was being used. In addition, the fiberboard boxes were oversized which resulted in crushing due to non-supportive loading when the cartons were placed in freezer storage.

Since the ingredient preparation area is located apart from the main production area, it is necessary to protect products between the two areas. This, of course, involves additional packaging materials. However, there seemed to be no problems in this area and no detailed study was deemed necessary.

No problems were noted in the salad area.

4. Conclusions:

a. Packaging cost differentials between the original design and actual operations were large enough to cause significant per serving cost increases in the Fort Lee facility.

b. Packaging systems must be given serious consideration in any proliferation effort.

c. Boil-in-bag type operation could supply many advantages over the $\frac{1}{2}$ steam table pan.

J. Energy

1. Purpose: To determine the energy consumption of CFPS in comparison

with the standard food service system.

2. Discussion: Food Service is a heavy consumer of energy. Furthermore, some evidence indicates that a considerable portion of this energy is misused or wasted. Therefore, since there is an energy crisis and energy is becoming more and more expensive, it is imperative that the energy consumption of new systems be investigated.

There are several ways in which energy usage can be evaluated. The two chosen for this evaluation were overall metering of a specific area of operations to obtain gross consumption figures and metering of individual pieces of equipment as they are used for specific tasks. The first method could be the "quick and dirty" method that will produce some answers almost immediately. The longer the period of data taking is, the more accurate the results will be. The second method is more precise, but will take much longer to produce usable results. However, it does fit in better with NARADCOM's R&D on energy in food service without requiring any more equipment.

3. Evaluation Results: Due to late decision to include energy measurements in the evaluation of CFPS, it has not been possible to obtain and install all of the necessary meters and equipment before the second week in October 1978. While some data has been taken, there are no usable data that can be used for this report. However, the work is continuing and it is expected that valid data from the area metering will be available by December 1978.

4. Conclusions: No data is available by the due date of this report. Data collection should be continued as long as possible to assist other energy studies and obtain data on current system.

V. Conclusions

A. The CFPPF was operating in a kitchen rather than a production mode during the entire evaluation period. Therefore:

1. Projected personnel savings of CFPPF were not even approached.
2. Projected material savings of CFPPF such as from increased yields were nonexistent.

B. Quality Assurance was operating, but its overall effect on food quality seemed minimal. Microbiological quality assurance of food safety was satisfactory.

C. Quality Control in CFPS was practically nonexistent. Therefore:

1. Quality of products leaving CFPPF varied widely even within individual lots.

2. Quality of products as affected by dining hall procedures varied widely.

3. Overall quality in consumers' plates was not as high as could be expected from a CFPS.

4. Adherence to SOPs', production guides, and similar controls was haphazard throughout CFPS.

D. Dining hall staffing was probably excessive as shown by indirect evidence (menu not adjusted for CFPF, nonuse of CFPF products, etc.)

F. The CFPS as operated during the evaluation period was not representative of what a CFPS could or should be. Therefore, it cannot be considered a valid test of the concept.

VI. Recommendations

In view of the resources that have been expended on this project and the existence of CFPF facility in being, it is recommended that the CFPS concept not be discarded due to initial unfavorable evaluation, but that CFPF be reorganized to run as originally designed. More important, but as part of this, it is recommended minimum staffing be established and run to a steady state in the CFPF and one or two dining halls to develop both the theoretical and the practical minimum staffing for the system. The desired data would furnish a basis for judging efficiency of any convenience food system, such as thermally processed tray pack as well as CFPF in its various configurations.



DEPARTMENT OF THE ARMY
US ARMY NATICK RESEARCH and DEVELOPMENT COMMAND
NATICK, MASSACHUSETTS 01760

REPLY TO ATTENTION OF:

DRDNA-WTA

22 June 1978

SUBJECT: Nutritional Aspects of Cook-Freeze Foods

Commander
US Army Troop Support Agency
ATTN: DALO-TAE
Fort Lee, Virginia 23801

1. Attached is a report "The Nutritional Effects of Processing and Reheating Centrally Prepared Foods" by Ms. Virginia M. White. This is in response to and completes a requirement placed on Food Engineering Laboratory in FY78 to conduct a literature search on nutritional aspects of cook-freeze systems.

2. Two things are evident in this report. First, very little direct research has been done on the nutritional aspects of cook-freeze systems. Second, there is no evidence that cook-freeze systems are more nutritionally deficient than the common feeding systems in current use.

FOR THE COMMANDER:

ABNER S. SALANT
Director
Food Engineering Laboratory

1 Incl
as



THE NUTRITIONAL EFFECTS OF PROCESSING AND REHEATING CENTRALLY PREPARED FOODS

BY

Virginia M. White

Food Engineering Laboratory
US Army Natick Research & Development Command
Natick, MA 01760

ABSTRACT

A literature search has been carried on because of an interest by the Troop Support Agency in the nutritive value of foods prepared and frozen in a central preparation facility and subsequently reheated in dining halls. 787 articles generated by a search of three computer systems and two data bases plus other food journals were perused for content. Surprisingly, little data was found on large quantity production of precooked, frozen foods. Losses of vitamins and minerals were found resulting from pre-treatment, freezing and reheating. Minimal information is reported on nutrient changes of mixed foods. More data is available on losses in fruits and vegetables. However, most investigators report minimal losses due to the freezing process. Losses of the more labile vitamins are greater during storage above 0°F. The dearth of information available on the cook/freeze system may be because of the rather limited use of this system. Much more work needs to be carried out to determine the actual changes in nutrients resulting from the use of the system. From the information available it does not appear that the consumer will be any more nutritionally deprived from this feeding system than by any other system in use today.

Effects of Processing and Reheating on Centrally Prepared Frozen Foods

The trend towards the use of convenience food systems involving in one instance central preparation, is currently being evaluated at Fort Lee. The authorities at the Troop Support Agency are interested in determining what effects, if any, prior cooking and subsequent reheating will have on the nutrients of the prepared foods. The seriousness of the losses depends logically on the nutrient and its contribution to the total diet. A search of the literature has been carried out to discover what work has been done and reported on this subject. Surprisingly little data was found, particularly in large quantity preparation. Some reports on individual servings of pot pie type foods were found and reports on frozen fruits and vegetables. Fenton surveyed the literature in 1960 and found only 12 studies on nutritive losses during the large-scale preparation of foods of animal origin for direct serving. Since frozen fruits and vegetables are used in most quantity feeding operations, their contribution to evaluating the system was minimal. The present report covers the finding of the search.

An On-Line search of three computer systems and two data bases was a part of the search. There were (1) "DIALOG" - The Lockheed Information System, (2) The Defense RDT&E On-Line System, and (3) "ORBIT" - the Systems Development Corporation system. This search was done by the Technical Library at Natick. The Foreign Intelligence Officer at NARADCOM used two data bases: (1) "AGRICOLA" - the Department of Agriculture data base system, and (2) "CIRC" - the DOD Scientific and Technical Intelligence data base.

The above mentioned printed out abstracts of 787 article which were perused for content. An unclassified document on Food Technology of Military Significance (Foreign) which was an Army Intelligence product on Convenience Foods and Feeding Systems of six free world countries and six

Communist countries revealed not one article on the nutritive value of prepared frozen meals.

Volumes of the Journal of the American Dietetic Association for the last 16 years and the Journal of the Institute of Food Technology were the source of the majority of the articles.

Glew, et al, (2) and Ang, et al, (3) hold that the quality of precooked frozen food depends on the quality of the raw material, the skill of the chef who prepared it and the quality of the equipment used in cooking, freezing and reheating. Very little was found on the effects of varying packaging materials and their influence on nutrient retention. De Ritter (4) said that the variations in the nutrient content of raw food may be due to genetic differences, climactic conditions and maturity at harvest. Advocates of frozen food claim that the freezing of foods fresh from the vine preserves more nutrients than the "fresh" item which may be a week in transit from the field to the table. Sam Martin, the editor of Quick Frozen Foods, in a lengthy report on the nutrient values of frozen vegetables as compared to fresh and canned (5) holds that frozen vegetables are nutritionally superior to fresh vegetables in the majority of nutrients. He holds that the consumer has the idea that since a frozen product is "processed", it must inevitably be inferior to fresh, and uses tests on five more popular vegetables to prove his point.

Losses of nutrients during the freezing process can result from the preparation of the foods for freezing (mainly peeling or trimming), leaching during water blanching, from preparation, and from prolonged freezer storage. Fennema (6) reports that substantial losses of vitamins can occur during freezer storage of vegetables and that the magnitude of the loss varies greatly with the product, the prefreezing treatment, the packaging and the

storage time and temperature.

The storage temperature and its effects were mentioned by several investigators. Kramer (7) reports on the maximum storage temperature he recommends for frozen fruits and vegetables. (See Table I) Lower temperature storage, below 0°F results in greater retention of nutrients. In a paper by Lachance, et al, (8), they report that vitamin losses in frozen foods are doubled or tripled with each five degree increase in storage temperature above 0°F.

Vitamin Losses

The most sensitive of the nutrients are the vitamins. Losses in mineral salts occur in wet processing by leaching, but can usually be ignored.

Mineral Losses

The loss of minerals by leaching into the water is not a matter of nutritional concern, in fact foods can absorb minerals from the cooking liquid, a matter of concern to those planning restricted diets.

Vitamin C

Vitamin C is one of the most readily destroyed of the vitamins. Because of this, its retention is often used as an index of the effects of processing and storage. Bender (9) reports that if the Vitamin C is well retained, then it is unlikely that there has been serious loss of other nutrients. Eheart (10), in work done on broccoli reports that 35% of the original ascorbic acid was lost in blanching, 7% in freezing and storage for one year, and 10% in cooking the frozen samples. Other investigators report similar findings. In work done by Glew in England, he reported losses from 26% to 72% between cooking and subsequent serving in school kitchens and in a hospital feeding situation. Frozen peas which had 20.5 mg. of ascorbic acid, when removed from the freezer, had only 1.1 mg. of ascorbic acid when it reached the

patient. This substantiates claims that the cooking process and subsequent handling is very important to nutrient retention. Sweeney, et al, (11) found that though the ascorbic acid content of uncooked frozen broccoli was somewhat lower than that of fresh broccoli, the retention of this vitamin in the ready-to-serve product was not significantly different in either form. In a report from Glew done in 1970, he claims a significantly higher percentage of ascorbic acid with their Cook/Freeze system than in their conventional system.

From the authors studied, the greatest losses in ascorbic acid appears to come from the pre-preparation involving peeling, trimming and blanching rather than from the freezer storage alone. Effects of storage time and temperature have been investigated by a number of authors. One author (7) claims that a -5°F freezer temperature not only maintains the sensory quality of vegetables like asparagus, green and lima beans and pears, but claims that 90% of the ascorbic acid will be maintained for 12 months when this temperature is used. At this same time, other vegetables such as broccoli, cauliflower, spinach and peas lost 20 to 50% of their ascorbic acid. There was only a 20% difference between freshly cooked broccoli and beans and the blanched frozen product stored six months at 0°F . These findings were reported by Noble and Gordon in 1964. A table in a publication by Harris and Von Loesecke (12) (see Table 2) charts work done by L. G. Davis in 1965 which showed a high percentage of ascorbic acid retention in frozen vegetables stored four months at 0°F .

B Vitamins

The B vitamins appear to be retained to a higher degree during the storage of frozen vegetables. The above mentioned authors (Harris and Von Loesecke) report that riboflavin, niacin, thiamine and other B vitamins

should be retained to a high degree under storage conditions acceptable for the conservation of ascorbic acid.

Glew (2) reports that the greatest loss of B vitamins is by leaching into water during the cooking of vegetables. However, since freezing has a softening effect on the texture of vegetables, the cooking time can be reduced. Less time in cooking, therefore, reduces the excessive leaching losses in extended cooking times.

Harris (12) holds that the B vitamins appear to be retained to a high degree during freezer storage. Burger, et al, (13) in 1956 reported that the capability of the freezing process in retaining most nutrients is well recognized. Van Arsdel, et al, (14) held that of all foods studied, none lost significant amounts of essential nutrients during the freezing process. Since meat is one of the best dietary sources of B vitamins, more findings are reported on retention or destruction of B vitamins in animal products. Livingston, et al, (15) report the retention of nutrients in freezing and subsequent storage of meat products is high provided storage temperatures are low and adequate protective packaging is used. Engler and Bowers (16) report no consistent trend in freezer storage time as related to thiamin, riboflavin, niacin and pantothenic acid in meat. Riboflavin is not effected by heat, so that heating is not of great concern as long as the foods are properly packaged to prevent damage from light. Engler and Bowers further report that niacin, B6 and pantothenic acid are not lost during freezer storage. Relatively few reports were found on the effect of cooking and storage on the nutritive content of poultry. One report was found on pre-cooked chicken and turkey meals which claimed that they deteriorated faster than frozen raw equivalents and that if they are to have a good shelf life, they should be stored well below 0°F. At 0°F, the meat will develop stale flavor and loss of juiciness after four to six months. (17)

Losses in thiamin are greater than losses in riboflavin and niacin according to Morgan, et al, (18). It was interesting to note that Hardinge and Crooks (19) in a table on the lesser known vitamins in foods, grouped "fresh or frozen" vegetables as contributing the same amounts of B6, pantothenic acid, biotin, folic acid, choline and inositol. Fennema in 1975 (20) found losses of B vitamins during the entire freezing process, but mostly during the frozen storage and thawing of the frozen animal tissue.

Schroeder (21) found in analyzing 12 frozen and 24 canned fruits and fruit juices that the loss of B6 was only 15.4% from freezing and 37.67% from canning. Hulse reported that the retention of vitamins in quick-frozen foods was higher than canned and the retention of thiamine higher because it is destroyed in the canning process. (17)

De Ritter (4) found high retention of B-12 in a number of frozen convenience dinners, (fish, fried chicken, turkey and beef). Seventy-nine percent to 100% of the vitamin was retained after heating.

Vitamin A

In the compilation of Harris and Von Loesecke they report an older study done by Volz, et al, in 1949 which reported carotene retention was 80 to 100% during storage for one year at 0°F. DeRitter (4) states that natural carotenoids in vegetables and fruits are usually stable during blanching, retorting and freezing, and further adds that in frozen and heat sterilized foods, carotenoids show good storage stability in most cases.

EFFECTS OF REHEATING

Livingston (22) holds that the trend toward convenience food service systems with its reliance on central preparation and freezing may indeed offer some incidental nutritional benefits, provided that the reheating of foods is carried out by rapid methods. Unfortunately only limited information

has been published concerning the nutritional implications of different methods of reheating in mass feeding operations, according to Ang and Livingston (3). Many authors have treated the subject of the various methods of reheating frozen foods and the nutrient losses in the various pieces of equipment (2, 4, 12, 15, 16, 18, 22, 23). Eheart (10) compared freshly cooked broccoli with broccoli frozen and cooked in a covered pan and broccoli frozen and reheated in a "boil-in-bag" and found the latter method retained more ascorbic acid than fresh cooking or freezing and conventional heating.

When rapid heating methods are used, such as microwave or infrared, the retention of heat-labile nutrients in frozen ready-to-heat foods may be better than in foods prepared conventionally and held hot for a period of time before serving. This was shown by Kahn and Livingston (20) who studied four precooked frozen products prepared and reheated by microwave, infrared and immersion, against freshly prepared products held in a bain-marie for 1, 2 and 3 hours. Thiamin losses in the latter were 22, 26 and 33% against a 6.5% loss in reheating the precooked frozen product by microwave, 9.4% for infrared heating and 14% for hot water immersion.

The losses in nutrients in reheating precooked frozen foods depends on many factors. Ang and Livingston (3) in their summary of the effects of reheating says that nutrient losses are dependent on several factors: (1) the type, quantity and configuration of the food - Is it bulk packaging or individual portions? How much does this affect the heating time, exposure to light, etc.?.; (2) the container, "boil-in-bag" pouch, is different than steam-table packaging; (3) the heating time and temperature of different ovens or steamers; (4) the handling of the foods both during and after reheating; (5) the heating rate of the equipment. Rapid heating preserves more of the heat-labile nutrients. Ascorbic acid and thiamin were found

unstable to heat, whereas riboflavin and carotene were more stable. Much of the available data compared freshly prepared food, which is then held on steam tables for 1, 2 or 3 hours, and the precooked frozen food, which is then reheated by a rapid-heat method (either microwaved, infrared or boil-in-bag). Kahn and Livingston (22) found the thiamin retention in three frozen entrees reheated by any of the rapid methods, exceeded by at least 10% the retention in the fresh entrees, held for one hour. Engler and Bowers (16) found that meats held in the frozen state and then reheated good amounts of thiamine, riboflavin, but had lost more B6 than freshly cooked muscle. When meat is heated by moist methods they report, more vitamins are transferred to the cooking drip than when dry heating methods are used. In general, there is little difference between the methods of cooking meat in the effect on destruction of the B vitamins.

There is little available data available regarding nutrient retention after reheating on a large number of foods. Livingston and his associates did most of the work found in this search. When they calculated actual retention values of thiamin by the same treatment, they found retention varied from product to product. Riboflavin retentions in four products tested were above 90% for any treatment. Cooking methods, products and presentation of data make direct comparisons of different researchers all but impossible to compare.

Livingston in a summation of one of his papers (23), concluded that much more needed to be done by serious food scientists on nutrient retention in these foods to benefit the ready-to-heat frozen food industry and the manufacturers of heating equipment in designing and preparing the procedures which will achieve maximum retention of nutrients in the foods offered for consumption.

Lachance, et al, (8) says that our knowledge of the loss in nutritive

values of foods during processing, handling, storage and reheating is pitifully poor.

The nutritional losses in food preparation should be viewed in perspective as to the importance they will have to the consumer. The average consumer, according to Bender (9) is consuming a hundred different foods, and when this is the case, the loss of certain nutrients is minimized unless this food happens to be the main source of the nutrient in the diet.

Until more feeding systems go to centralized preparation of foods, it is unlikely that much work will be done by the scientific community. However, from the information available, it does not appear that the consumer will be any more nutritionally deprived from this feeding system than by the other (fresh or canned) systems in use today.

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^a Adapted from WRRL-TTT Studies

^b Adapted from Davis (1956)

^c Adapted from Haggart et al. (1954)

^d Adapted from Dubois and Kew (1954)

TABLE 1

Maximum Storage Temperatures for Frozen Fruits and Vegetables
for General Quality Retention Compared to Vitamin C Losses

	Months in Storage			
	6	12	18	24
Asparagus				
Quality ^a	0	- 5	- 8	-12
Vitamin C Loss ^b				
10%	+ 6	0	- 1	- 2
25%	+ 7	+ 3	0	- 1
50%	+ 8	+ 4	+ 2	0
Broccoli				
Quality ^a	0	- 5	- 8	-12
Vitamin C Loss ^b				
10%	-14	-40	-50	-
25%	+ 2	- 2	- 5	- 7
50%	+ 9	+ 7	+ 4	0
Lima Beans				
Quality ^a	+ 4	- 3	- 6	- 8
Vitamin C Loss ^b				
10%	+ 5	+ 2	0	- 1
25%	+10	+ 5	+ 2	0
50%	+20	+ 9	+ 5	+ 2
Green Beans				
Quality ^a	+ 4	- 3	- 6	- 8
Vitamin C Loss ^b				
10%	- 3	- 5	- 7	- 9
25%	+ 3	0	- 2	- 3
50%	+ 8	+ 3	0	- 2
Cauliflower				
Quality ^a	+ 4	- 1	- 3	- 5
Vitamin C Loss ^b				
10%				

TABLE 2

FOODS OF PLANT ORIGIN

Retention of Ascorbic Acid in Frozen Vegetables During Storage*

<u>Vegetable</u>	<u>Prestorage Ascorbic Acid mg/100 g</u>	<u>Storage Time Months</u>	<u>% Retention at</u>		
			<u>10°F</u>	<u>0°F</u>	<u>-20°F</u>
Asparagus	40	4	50	100	100
		8	10	90	100
		12	10	90	100
Broccoli	78	4	50	80	95
		8	20	80	90
		12	15	73	90
Green Beans	14	4	45	85	100
		8	30	85	100
		12	5	70	100
Wax Beans	22	4	35	95	100
		8	25	90	100
		12	15	75	100
Lima Beans	21	4	80	92	96
		8	72	95	98
		12	47	74	86
Cauliflower	78	4	70	95	100
		8	30	55	80
		12	20	50	80
Peas	17	4	75	100	100
		8	58	95	100
		12	21	89	98
Spinach	31	4	45	85	100
		8	15	50	85
		12	10	45	90

* Adapted from Davis (1956).

ANNEX D

USER/OPERATOR EVALUATION

DIRECTORATE OF FOOD MANAGEMENT

FORT LEE, VIRGINIA

AD-A067 929

TROOP SUPPORT AGENCY (ARMY) FORT LEE VA
CENTRAL FOOD PREPARATION SYSTEM. (U)
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USER/OPERATOR EVALUATION
CENTRAL FOOD PREPARATION SYSTEM (CFPS)

FINAL AFTER ACTION REPORT

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SECTION I

SUMMARY

1. Fort Lee provided Department of the Army with physical facilities and personnel required to operate a Central Food Preparation System (CFPS).
2. Food production operations were centralized in a series of existing buildings modified for the purpose of supporting post feeding requirements while serving as a vehicle to further develop, test, evaluate and refine required policies, procedures and techniques prior to initiating permanent operations.
3. During the period 1 February 1978 until 1 October 1978, the Fort Lee CFPS produced 4,340,748 servings in support of 1,901,009 meals served in satellite dining facilities. This was accomplished with a dining facility staff thirty per cent below the level recognized by US Army Training and Doctrine Command (TRADOC) Manpower Survey and US Army Troop Support Agency (TSA) Food Management Assistance Team review.
4. Although many of the goals set for CFPS were realized, effective evaluation of all aspects of the system could not be achieved due principally to the underestimation of the time required to reach a steady state of production. Initial overproduction, based upon projections made six months prior to activation of the central kitchen, resulted in high inventory levels, which in turn, dictated subsequent downward adjustment. This situation, coupled with a reduced level of supported strength, further resulted in production runs considerably below the point necessary to accurately measure effectiveness of efficiency.
5. Dining facilities continued to adhere to the Master Menu as closely as possible utilizing centrally prepared items. Breakfast and short order meals were largely unaffected by CFPS production.
6. Minimum staffing in the dining facilities began to affect both the quality of service and finished product as the dining facility managers were required to fill in for absent cooks at the expense of their supervisory duties. The evaluation of the CFPS took place during this period of fluctuating conditions.

7. Although measurable improvement has been realized in both operating conditions and finished product, considerable effort is still required to reach a steady state within the system. Modification of conceptual elements of the evaluation such as the 42 Day Menu cycle, reliance upon the Army Supply System, and staffing of the Central Kitchen and dining facilities could substantially improve operations. However, the degree of expected improvement will not materially influence the overall outcome of the evaluation.

8. Based upon these and other factors, the following recommendations are provided:

a. Terminate the Central Food Preparation System at Fort Lee.

b. Reassess the function of the Ingredient Scaling and Preparation Branch (ISPB) as an entity, and study the feasibility of its application in support of Installation Food Service Programs Army-wide.

SECTION II

INTRODUCTION

1. Purpose: To provide an operational environment for the conduct and evaluation of a Central Food Preparation System and assist in the evaluation of this system from the perspective of the user/operator.

2. Scope: The CFPS, for purposes of this evaluation, will consist of Central Food Preparation Facilities (CFPF), Satellite Dining Facilities (SDF), the Troop Issue Subsistence Activity (TISA), and a Technical Support Office (TSO). In addition to these elements of the CFPS, other activities within the purview of the Directorate of Food Management (DFM) will be included as they relate directly to the functions of the CFPS. The evaluation period commenced on 3 April and concluded on or about 27 October 1978.

3. Background:

a. The original program for CFPS development Army-wide, as proposed by the Department of the Army Subsistence Operations Review Board and tested at Fort Lewis, Washington, accepted in principle the concept of central food production. Subsequent command decisions based upon changed requirements, modified the decision to construct permanent CFPF's and directed construction of an interim facility at Fort Lee to serve as a vehicle to further develop, test, evaluate and refine required policies, procedures and techniques prior to initiating permanent operations. Permanent CFPF's originally scheduled for construction were suspended until evaluation of the interim CFPF and a decision on system adoption was made by the Chief of Staff of the Army. The original concept of the Central Food Preparation System incorporated the integration of menu, professional staff, and physical facilities with sufficient supported diner strength to assure continuous and complete exercising of the entire system. Original plans for the CFPS placed most elements of operation in one building. However, due to an engineering discrepancy, a late determination was made that the CFPF would not be housed in the originally selected facility. This required new site and building selections. The sites and buildings were not as desirable as the original location, but were the best available at the time. As planning continued, additional constraints were imposed. The professional staff programmed to operate the CFPS was greatly curtailed, as evidenced by comparing the 12 January 1977 TDA (TAB A) with the originally proposed TDA

(TAB B). The requirements to review the Fort Lee operation for cost effectiveness influenced decisions not contemplated in the original concept. These major changes from the original concept impacted heavily on the capabilities and resources made available to the user/operator.

b. The Central Food Preparation Facilities have been housed in existing installation facilities which were renovated for this purpose. Below is a listing of initial facilities' design cost, construction cost and equipment and installation cost:

	<u>Design Cost</u>	<u>Construction Cost</u>	<u>Equipment & Installation</u>	<u>TOTAL</u>
Central Kitchen (S-6220)	\$ 64,088	\$ 483,961	\$ 847,128	\$ 1,395,177
Laboratory (T-11110)	29,198*	300,685*	39,045	368,928
Ingredient Scaling and Preparation Facility (P-7118C)			81,405	81,405
Pilot Kitchen (P-7118C)	7,194	54,400	69,202	130,803
TOTAL	\$ 100,480	\$839,046	\$ 1,036,787	\$ 1,976,313

*Includes Ingredient Scaling and Preparation.

c. In addition to construction of the Central Kitchen Facilities (noted above), modifications were made to the dining facilities to facilitate the storage, handling, and production of centrally prepared food items.

d. Under the guidelines provided for the conduct of the CFPS evaluation, maximum use of existing procedures and regulations was directed. US Army Master Menu was used as a guide and standard for the menu produced and served within the system. Supply and subsistence items were obtained through normal supply channels with few exceptions. The support of other activities on the installation, such as Civilian Personnel Office, Directorate of Facilities Engineering, MEDDAC, etc, was that normally expected of any post level activity.

e. Special consideration was requested and received through channels from Department of the Army for the stabilization of key military personnel through the evaluation period, December 1978. The Commanding General, Fort Lee, agreed to support all manpower requirements. Funding for all activities related solely to the evaluation of CFPS was borne by the US Army Troop Support Agency.

4. Objectives: To provide those facilities, personnel and resources necessary to operate an integrated food production and feeding system and to conduct an in-depth evaluation of the system within the perimeters of the Evaluation Plan (TSA Report CS-SD-7713).

SECTION III

CONDUCT OF THE EVALUATION

1. The CFPF operation during the evaluation period was in accordance with SECTION V, Annex A, to TSA Report CS-SD-7713, Evaluation Plan, Central Food Preparation System, Fort Lee, Virginia, 27 February 1978.
2. The day to day functions of the Directorate of Food Management were maintained throughout the evaluation period. Observations, the gathering of data and specialized reporting requirements, were accomplished in addition to the normal food service activities of assigned personnel.
3. Orientation as to areas of key interest was provided to supervisors as dictated by the evaluation plan. Cooks and food service workers were familiarized with the system through a series of briefings and tours in addition to hands on training conducted in the dining facilities. Forms and formats specially designed to capture relevant data were produced and modified as necessary to facilitate day to day operations.
4. Every effort was made to maintain an operating environment approximating that which existed before the start of the evaluation in order to minimize the introduction of bias and the predetermination of test results. Initiatives on the part of the individual operator were discouraged when in conflict with the overall concept of evaluation.

SECTION IV

OBSERVATIONS AND FINDINGS

1. Impact of CFPS on Staffing Requirements.

a. The CFPS was established under a Directorate of Food Management at the staff level of the installation. The primary mission was to carry out the objectives of the Army Food Program and supervise all installation food service personnel on a centralized basis. The secondary mission was to serve as an operational environment for the evaluation of new concepts and systems developed for the Army Food Program. The CFPS was the primary system evaluated. Staff to accomplish these missions and to operate the DFM was obtained from existing resources; the Services Division, Directorate of Industrial Operations (DIO), authorized TDA military and civilian cook personnel, borrowed military manpower (18 TOE military cook manyears), civilian direct hire mess attendants, and six spaces specifically designated for CFPS functions. As evidenced by the above, the secondary mission to establish, operate and assist in the evaluation of a centralized food preparation system was effected with limited staffing over and above that which would be normally required to operate an Army Food Program. The necessity to staff a directorate for installation level management and administrative functions drew down on the resources available to operate dining facilities, TISA and CFPF. This condition also impacted heavily on management resources available for the supervision and control of requirements involving the construction, renovation and modernization of facilities and equipment required for the CFPS. In spite of this restrictive staffing, established internal time tables were met. The supervisory personnel within the dining facilities were required to rapidly learn new food preparation techniques; i. e., reconstitution of frozen food items, operation of specialized food production equipment, and to accommodate the satellite dining facility concept to existing dining facilities with a reduced work staff, as cook personnel were diverted to the CFPF. This necessity to constantly draw down resources in dining facilities in order to operate the CFPF did not provide time or resources required for an orderly transition from decentralized food service operations to centralized food preparation system. This condition affected the morale of dining facility personnel and, ultimately impacted unfavorably on the apparent benefits of the CFPS.

b. These conditions, coupled with a number of reduction in force actions which required training of personnel coming in to dining facilities and CFPF from other post activities further adversely impacted on the operations of these facilities. During the initial planning stages, it was agreed that the resources available to the DFM were the minimum needed to operate the system, and that additional resources would be authorized and the directorate would be exempted from personnel reduction. However, the directorate was effectively reduced in military and civilian personnel space authorizations by deletions of key staff positions as provided in the 12 January 1977 TDA.

2. Staffing Adequacy of the CFPS as Provided by the TDA Dated 12 January 1977 and Impact Upon Operations.

a. The original concept for personnel staffing for the Directorate of Food Management, to include the CFPS, provided sufficient personnel to operate, evaluate and modify the organization as required by changes in the mission and methods of operations. The adequacy of this staffing was reviewed in part by a pilot test conducted during the summer of 1977, at which time minimum support levels for dining facility operations were determined. It was recognized that maximum efficiency must be realized at the dining facility level in order to insure personnel savings, the primary purpose of centralized food operations. Based upon these observations, a revised TDA was provided for TSA/DADCSLOG coordination. As requested by the Office of the Surgeon General, all MEDDAC related positions were assigned to the local MEDDAC under the operational control of the DFM. Overall personnel constraints within the restructured organization, with the personnel ceiling in effect prior to the operation of the Central Kitchen and satellization of the dining facilities, caused a further modification of the proposed TDA. Several technical positions for personnel to serve in the role of systems developers and evaluators were deleted from the TDA, to be filled by other means. Among these positions were Food Technologists and Industrial Specialists, thereby stripping the organization of critical quality control and technical development capability. A provision was made that the services of on-board technicians at the TSA could be utilized, as available, to fill these needs.

b. The utilization of TOE food service personnel was clarified to insure that no more than eighteen individuals could be included in the authorized staffing. Agreement was also reached whereby military personnel shortages existing in the DFM could be filled on a one-for-one basis from personnel assets available from the excess TOE food service manpower. Provisions were also made to provide rotational training for those food service personnel of the TOE units not regularly employed within the system during the evaluation. Subsequent events overcame this contingency in that through normal duty requirements, personnel absences, and field training exercises, little or no excess manpower was available.

c. Fill of authorized staff positions was accomplished in the most part utilizing in-house assets, based upon the assumption that the incumbent individuals could adequately meet the requirements imposed under the new methods of operations. Problems encountered for specialized skill requirements were presented to the Civilian Personnel Office. The down-grading/ regrading of approved technical and supervisory positions increased the difficulty of obtaining the necessary skills in a critical time frame. Specific problems will be addressed in their functional areas, below. The further assumption was made that a cross-over of skills in both the military and civilian operating staffs could be accomplished with little problem and sufficient training provided in a short time to overcome any deficiencies. Such was not necessarily the case in all instances.

d. Specific comments keyed to functional areas are presented as follows:

(1) Office of the Chief, CFPD.

(a) The Chief of this Division must have a varied food oriented technical background, as the leadership requirement is based both on technical as well as managerial abilities.

(b) The position of Industrial Engineer (Production) requires more food production experience than management expertise. The difficulty in filling this position caused major problems within the development and operation of the overall system. The waiver of food service experience in order to obtain the services of an engineer was particularly detrimental in light of the fact that only thirty days was available between the position fill date and the commencement of the evaluation.

(c) The TDA was particularly deficient in that it did not provide sufficient capability in the areas of product development and technical food production skills. Addition of food technologist support within this office could have greatly reduced time lost using trial and error methods in problem solving. The "borrowed" labor of the food technologists assigned to the TSO and at TSA were of some assistance, but the press of other duties restricted their effectiveness.

(d) It was also necessary to establish an Accounts Maintenance Clerk (Typing) position working thirty-two hours part time. This individual assists the Industrial Engineer and the Statistical Assistant with the large volume of administrative work generated through the lack of an automated production scheduling module.

(2) Ingredient Scaling and Preparation Branch.

(a) The importance of the function of this branch of the CFPD has been underestimated. A branch chief in the grade of warrant officer (MOS 941A) or GS-11, Industrial Specialist, is required to insure proper performance of the branch mission, assignment of personnel, training in food service procedures and techniques required in the ISPB operation, coordination with the Central Kitchen, TISA, and other activities and branch administration. This position is in addition to the NCOIC position (E-8) presently authorized. The NCOIC should be made available in the production/processing area of the branch at all times. Without a branch chief, the NCOIC must perform all administrative duties of the branch as well as oversee the work being performed in the production areas. This proved to be too much responsibility for one individual to bear over a sustained period.

(b) Two additional food service personnel should be assigned to the branch to pre-shingle bacon for the dining facilities. If this function is performed centrally, an estimated three manhours per day per dining facility would be saved. This time could be devoted to other essential tasks within the dining facilities.

(3) Central Kitchen Branch.

(a) The original concept that supervision of the actual food production within the Central Kitchen would be provided by the Industrial Specialist and one Senior Non-Commissioned Officer proved to be unworkable. The administrative burden placed upon these two individuals in the supervision of such day to day requirements as work scheduling, personnel actions, raw product inventory, personal and facility sanitation, severely restricted their abilities to provide overall supervision of production on a continuous basis. It further placed undue reliance upon less skilled personnel such as shift and work leaders. In an operation as varied as that undertaken in the CFPS, highly qualified food production personnel must be available at all times to assist in the execution of production plans and quality control. In order to meet this requirement, the branch chief must be freed of his strictly operational role as the joint floor supervisor so that he may coordinate the myriad activities of this branch. One additional supervisor, either fully qualified Senior Non-Commissioned Food Service Sergeant or comparable civilian, should be added to the organization to free the branch chief to adequately supervise this complex operation. It is critical that these three individuals have hands-on practical training in commercial high volume food production.

(b) Food Preparation Staff. The staffing of the Central Kitchen with both cooks and bakers was accomplished with the idea being that simultaneous production of entrees and desserts would take place. The bakers, all of whom were former cooks, could easily adapt to entree production, whereas the majority of cooks did not possess baking skills. This situation provided an increase in available cook skills but did not provide the same flexibility in dessert production. In actuality, due principally to the size of production lots, either one group or the other was underutilized. The employment of a full time permanent work force of cooks, bakers, food service workers and janitors, especially during periods of limited production, resulted in extended non-productive time. The ability to schedule employees to fit the production plan is mandatory if any degree of efficiency is expected. Considerable saving could accrue by reevaluation of the food production staff and the alignment of work hours with production.

(4) Food Service Workers. A separate job classification is required for the work performed by the food service workers in both the Central Kitchen and the ISPB. At present, the job classification and job description is the same for these workers as in the dining facilities. The work, however, is considerably different in many aspects and requires certain skills above those required in the dining facility.

(5) Office of the Chief, Dining Facility Operations Division.

(a) Although not identified prior to the onset of the evaluation, a Food Service Sergeant was required to augment the administrative staff of the Dining Facility Operations Division (DFOD). This individual was needed to effectively control the utilization of assigned civilian, TDA military and TOE food service personnel. To fill this void, a Master Sergeant (E-8), excess to the installation, was assigned to serve as a Food Service Operations NCO responsible for the highly critical task of balancing manpower resources with requirements in the shifting of cooks and food service workers between facilities. Without a system to centrally control and shift personnel to fill voids in staffing caused by various reasons, i. e., TOE personnel going to the field, mandatory training or maintenance of field equipment, sick leave, administrative absences, etc, dining facility operations could not have been accomplished effectively.

(b) The employment of a civilian by TSA to assist in monitoring dining facility operations and to collect data on the test was also required. Employment of this individual was essential to augment the DFOD staffing which was

not able to operate and control dining facilities on a central basis and simultaneously assist in the conduct and evaluation of a CFPS Test. This individual was most instrumental in insuring that food service personnel complied with the parameters of the test and in expediting the refinement of product handling/reconstitution procedures.

(c) Dining facility personnel performed well under the most austere and difficult conditions, particularly during the first sixty days of operations. It was immediately apparent that cook resources were at, or below, absolute minimum necessary to adequately prepare the largely non-CFPF supported breakfast and short order meals. In most cases, the absence of one cook would reduce the shift strength by fifty per cent, causing the diversion of all supervisory activity to food production. The result was less than adequate supervision and greater reliance on less skiller labor to oversee reconstitution and handling of CFPF products. This in turn increased reliance on yet unproven "standardized" reconstitution procedures, leading to less than optimum finished products. As these conditions continued, any benefits the dining facility staff might have expected to accrue from reduced entree preparation involvement was largely offset. The positive attitude most workers had toward the test declined to a point where just getting the troops fed was more important than how exactly the rules were being followed. At the initiation of the evaluation period, some relief was granted to increase cook staff in three facilities (P-3701, P-8400, and P-8402) from excesses generated upon closing of a temporary facility. Food quality from the Central Kitchen also improved as production experience was gained (TAB C).

(d) Although morale was high initially, food service sergeants and first cooks became less receptive to the central food production system which made their working conditions difficult as well as adversely affecting the professional food service standards to which they have become accustomed. At the onset of the test, devoted personnel put in extra hours of their own time in order to accomplish the mission, in spite of staffing restrictions.

(e) The absence of 240th Quartermaster Battalion personnel, because of scheduled prime time training, field training exercises and other TOE mission requirements, also had a serious effect on the capability of DFOD to adequately staff the dining facilities on a day to day basis. Much time was required to juggle available personnel to insure that each facility had the minimum essential cooks to prepare and serve meals. The practice of frequent turnover of cook personnel in a facility is detrimental to the facility concerned. Not only does such a practice require constant training and familiarization, it also hinders the establishment of a close working team relationship among food service personnel.

(f) Due to the management time devoted to resolving staffing problems, many of the normal tasks of the food advisor/supervisor were not adequately performed. Examples are, attention to dining facility account status, meal card verification, in-depth facility inspection, future planning for facility upgrade/modernization, personnel incentive programs, etc. The limited staffing in SDF's resulted in much deviation from standard modes of operation. In numerous instances, the fear that "we can't get ready in time for the next meal" set in. For example, progressive cookery for breakfast items had to be altered by early preparation of extra servings of french toast, pancakes, bacon, etc. Scrambled eggs were made in batches versus individually, and, based on the availability of the staffing, eggs and omelets to-order services were restricted.

(g) Limited staffing also prohibited food service sergeants from conducting a viable and progressive on-the-job training program. Little time was available to adequately garnish serving lines, maintain equipment, insure proper stock rotation, and maintain acceptable sanitation standards. It is evident that without an adequate number of cooks and food service workers, food service sergeants must establish priorities as to which tasks will be accomplished. In most instances, the preparation and serving of food and cursory sanitation efforts were all that could be accomplished unless other measures were employed (payment of overtime, extra duty, etc).

(h) It is apparent that the complete functions of cooks and food service workers were not thoroughly analyzed prior to developing a reduced TDA for the CFPS test, as the sanitation of equipment and floors in the food preparation area, serving lines, freezers, reefers, hoods, grills and ovens are largely cook-performed tasks. It appears that the reduction of cooks due to the use of centrally prepared items did not take into consideration this fact.

(i) An effort to "store" some food service worker labor by the addition of portable soiled tray carts in Dining Facilities P-8400, P-8402 and P-3206 was enthusiastically welcomed by diners and unit commanders as it negated the requirement for diners to scrape their leftovers into garbage cans. However, this action was not accompanied with a proviso for added food service workers to accomplish the scraping and sorting of dishes, trays, glasses, cups and silverware previously accomplished by the diner. The trade-off between troop labor and food service worker labor only increased the workload during the periods between/after meals, which further adversely affected regular cleanup and sanitation duties.

(j) It is realized that savings in manpower can result from using centrally prepared products. Centrally prepared salad ingredients, peeled potatoes, fruit gelatin, pies, cakes, cookies, etc, have a high degree of acceptability among all personnel. The exact number of individuals that each dining facility can save by the use of CFPF items cannot be determined readily. Initial efforts to get by with the least number of cooks is apparent from authorizations reflected at Inclosure 4 (TAB D). At Inclosure 5 (TAB E) is the staffing recommended by the TSA Food Management Assistance Team, as well as staffing recommended by the TRADOC Manpower Survey Team.

(k) The personnel work sampling study executed in SDF's is questionable. Data collectors were not required to record whether required functions, i. e., cleaning of reefers and equipment, progressive cookery, etc, were being accomplished to a satisfactory degree. A report showing all personnel actively employed throughout most of the day does not necessarily indicate that the job is getting done.

(l) The prime complaint voiced by the food service sergeants of the CFPS test is that an inadequate number of personnel were provided to do the job right.

(6) TISA Staffing. TISA staffing was adequate to support the requirements generated by the CFPS. Extra forms and related files were required to maintain an accurate audit trail. Additional deliveries by assigned truck drivers and an increased handling of items by warehouse personnel were noted as a result of CFPS.

(7) Technical Support Office. The overall mission outlined for the TSO greatly exceeds the capability of the individuals assigned to this office in the areas of quality control and product development.

(a) TSO Inspection. The staffing level for inspection is inadequate. As an example, a problem arose when the Veterinarian Food Inspector assigned to the Central Kitchen arrives at 0145 for swabbing of the equipment for a sanitation report prior to initiation of bakery production at 0200. On occasion, this person could not leave until 1400. To do the job properly, and write reports, many hours of prolonged duty were incurred. Add to this, military type duty, mandatory training, unit functions, etc, which take this person away from the duty station. At present, one person is assigned to cover the reconstitution, cleanliness, and looking at equipment at eight to ten dining facilities. This can only provide very loose spot checks.

(b) TSO - Microbiological Laboratory. The staffing level as written in the TDA is adequate.

(c) TSO - Sensory Evaluation. The requirement for supervision of this activity, originally envisioned as a function of the Dietitian or Food Technologist, subsequently deleted from the final TDA, was again recognized at the outset of operations. One additional position was added to the TDA as a result (filled by an excess O-1). Presently there are seventeen people trained in sensory evaluation work by technical experts of Natick Research and Development Command (NARADCOM).

(d) TSO - Sanitation. The ten spaces provided on the TSO's TDA are adequate. How the cleaning is to be accomplished is the TSO area of concern, but when the particular piece of equipment needs to be cleaned depends upon the production schedule; therefore, operational control actually falls under the supervision of the production personnel.

3. Impact of CFPS on Distribution and Storage Requirements.

a. The distribution plan for subsistence items in effect prior to the initiation of the CFPS Evaluation was modified to include the additional transportation required from the two separate operating entities, ISPB and Central Kitchen. It is recognized that a permanent CFPF would incorporate both operating branches, but its location in relation to the TISA would still have an important impact upon the efficient use of transport personnel and equipment. The availability of refrigerated vehicles of the proper size is a further requisite of an efficient distribution system. On numerous occasions reefer vans were substituted for one and one-half ton refrigerated trucks, complicating the movement of product and the ready access to small dining facilities.

b. The use of both power driven and gravity conveyors greatly enhanced the loading and unloading of vehicles at both the Central Kitchen and TISA. This was of particular value when considering that the entire Central Kitchen was located on one level. The addition of a mechanical tail gate hoist further simplified handling procedures at the Central Kitchen facility.

c. Storage.

(1) Following a review of existing storage facilities at Fort Lee, it was determined that additional freezer storage was required at both the TISA and dining facility level. Consolidation and rewarehousing greatly reduced the problem within TISA cold storage. On some occasions, product was retained in the Central Kitchen temporary storage freezer for periods longer than required for laboratory clearance. This relieved some pressure upon the TISA cold storage, but resulted on occasion in reduced production by the Central

Kitchen due to lack of freezer storage space. The shortage of freezer capability at the dining facilities was in most part solved by the addition of 800 cubic foot prefabricated freeze boxes installed in or adjacent to each operating dining facility. In the case of those facilities without permanent built-in freezer storage, additional handling of frozen products was required to adequately manage the frozen food stocks in the one walk-in box. Additional problems were encountered in the large dining facilities during four or five day holiday periods due to restricted storage space.

(2) The chilled item storage space available within the ISPB was insufficient to provide for adequate segregation of incoming fruits and vegetables, completed salad, and processed meat items, and for the tempering of frozen meats prior to processing within either ISPB or the Central Kitchen. The co-location of raw and finished products with meats is in contravention to good storage practices and must be addressed in any plan for the permanent construction of a central facility. Addition of the microwave tempering tunnel could have alleviated some of the problem by allowing a more expeditious transfer of meats from freeze storage to final processing without extended tempering at refrigerated temperatures.

(3) Temporary TISA freezer storage for items on hold by the laboratory or awaiting disposition, occupied excessive space due to lack of a separate area for segregated storage.

4. The Requirements For and Adequacy of the Production Planning, Scheduling and Control System.

a. An adequate production planning, scheduling and control system for a CFPS is essential. The system utilized during the evaluation was unsatisfactory. The concept of operation provided for an automated production planning, scheduling and control module to be developed and made available to the CFPD. This did not materialize and it was necessary to develop a large-ly manual system. This manual system was cumbersome and unreliable and required the hiring of a 700 hour appointee to assist in its development until the Industrial Engineer was hired.

b. The manual system was developed using FY 77 dining facility utilization figures of Master Menu components. The system provided that dining facilities be required to follow the Master Menu (as changed by the Installation Menu Board) until such time that data could be developed insofar as

estimated quantities-to-produce were concerned. This was necessary in order to begin supporting dining facilities in February 1978 in anticipation of the requirement to provide full support commencing 1 March 1978.

c. This system proved unreliable due to the inability to adequately determine the anticipated demand during a period of reduced Fort Lee troop population which was unforeseen during initial production planning.

d. The high inventory level generated by over-production in March and April 1978 dictated subsequent reduced production and resulted in the inefficient usage of personnel in the Central Kitchen in the following months (TAB F). The low productivity level soon became detrimental to employee morale, as production was limited to one, and sometimes two, entree items per day. To solve low production and increase employee morale, the following actions were taken, even though they did not follow the basic concept of operations:

(1) Full utilization of high capacity equipment was curtailed resulting in better utilization of personnel. This caused more frequent production runs of products using a smaller batch size.

(2) The Installation Menu Board, along with the Dining Facility Operations Division and the TISA, took positive action to almost totally exclude non-CFPF products in the monthly menu.

(3) An excess item list was developed and published and the SDF's were permitted to order any of these items as additional requirements.

e. The above actions increased production runs during the last two weeks of June. Such action also permitted the smoothing out of "peaks and valleys" in production.

f. The CFPF was tasked to insure that items reflected on the Master Menu (as modified by the Installation Menu Board) were produced and available in adequate quantities for issue on the dates scheduled. However, substitutions were made periodically due to limited stockage of items for various reasons at the TISA. Food service sergeants were, in most instances, contacted to select substitute items. Problems arose when the cost per serving of remaining available substitute items was more costly than the item programmed for issue and the dining facility accounts were approaching an overspent condition, therefore, unilateral substitution action by TISA could not be effected readily.

g. Production planning and stockage levels for pastry products were not totally satisfactory. Limited storage space at the TISA prevented increased production of pastry items needed to enable SDF's to order items as envisioned in the original concept and necessary to generate utilization data based strictly on demand. On occasions, dining facilities were required to accept as substitute items such products as cranberry crisp and pineapple cream pies, which do not have a high troop acceptability.

h. In the absence of the production scheduling module, the almost total reliance on manual processing of requirements resulted in a marked reduction of efficiency on the part of both the Industrial Engineer and the Industrial Specialist. Time devoted to these activities was made at the expense of food production. The reliance on imprecise demand data and insufficient consumption history frustrated both the individual and joint efforts to establish a high degree of management efficiency.

i. The desire to provide the diner with the widest selection of items at each meal and the maximum amount of management discretion for each dining facility manager, while insuring an efficient production process, requires a relatively large and varied inventory to be maintained at the TISA at all times. This optimum system could not be implemented as projected due primarily to the relatively short period allocated to developing demand history, the requirement to consume initial over-production, and the physical constraints of limited frozen storage space. Therefore, the system whereby discretion was withdrawn from the dining facility manager and items made available based upon the Master Menu and/or director of the Installation Menu Board almost exclusively, remains the situation even after the initial evaluation of the CFPS.

5. Adequacy of Procedures to Account for Subsistence Transferred Between the TISA and CFPF. Subsistence accounting procedures were adequate for subsistence transfers between CFPF and TISA. This was verified by an independent review by CPT Rohan, TSA MOB Designee, a CPA. The Installation Comptroller Internal Auditor, Mr. W. C. Brittingham, also reviewed these accounting procedures in September 1978 and confirmed CPT Rohan's findings.

6. Impact of the CFPF on the Installation Stock Fund and the ARCS.

a. There was no impact on the installation stock fund resulting from the CFPS.

b. There was no significant impact upon the ARCS at Fort Lee insofar as dining facility financial postures were concerned. There was a limitation, however, upon the ability of food service sergeants to deviate from the Installation Master Menu in the ordering of entree items from the CFPF.

7. Impact of CFPS on Skill Level Requirements for CFPF Activities.

a. Requirements of the CFPD:

(1) Office of the Chief.

(a) The varied duties demanded of the Division Chief require an individual with a great degree of technical knowledge and professional experience. These qualifications are not generally available in an officer with a broad logistical base. It appears this position should be designated as one to be filled by an officer from the "Experience with Industry Program".

(b) The requirement for the skill inherent in an Industrial Engineer is questionable. The substitution of a technically qualified Food Technologist, as previously discussed, could adequately fill the demands currently recognized of this position.

(c) If production scheduling remains a manual operation, the temporary appointment of an Industrial Specialist at the GS-5 or GS-7 level should be recognized as a permanent position.

(2) Ingredient Scaling and Preparation Branch. The basic skill levels of personnel within the ISPB are adequate with the exception of overall supervision. There is a requirement for administrative functions which are currently being accomplished by the NCOIC to the detriment of production. With the increased importance of this activity and the impact on the Central Kitchen, there must be a branch chief to provide the administration and supervision required. The branch chief should be either a Food Service Warrant Officer or a GS-11 Industrial Specialist (food service).

(3) Central Kitchen Branch. The skill levels provided are adequate with the exception of one of the WG-5 cook positions. This position should be elevated to the WL-8 Cook Leader level to permit a greater degree of continuity and expertise on the production floor. Though the TDA requires a WG-5, a WL-8 was assigned to the slot to obtain the required skill level.

b. The TISA skill levels were considered adequate.

c. No special skills were deemed necessary in DFOD for food personnel to handle CFPF items. Thorough indoctrination and constant follow-up had to be accomplished to condition personnel into following product handling instructions.

d. The skill levels in the TSO were considered adequate.

8. Problems Encountered with Military Subsistence Supply System.

a. Raw Ingredient Quality. The quality of raw ingredients of certain products is such that the most acceptable finished product is not being produced. Those that present the most significant problems are:

(1) Diced Beef: The diced beef has not been uniform in size and often contains large amounts of fat and gristle. Sensory evaluation reports and consumer feedback indicate that the diced beef is tough and rubbery. Some reports state it is like "bubble gum - the more you chew it, the bigger it gets". This problem was overcome by hand trimming the diced beef prior to use. This type of individual treatment, however, is not feasible with the quantities required for processing in the ISPB and the Central Kitchen.

(2) Chicken, Cut-Up: Two basic problems have been experienced with cut-up chicken; first, the inconsistent size, and second, the reported "black bone" effect caused by processing frozen chicken. The packaging methods of chicken products, i. e., certain numbers of servings, required packaging by number of wings, breasts, thighs, and legs. Because of the small size of the chickens received, the SDF's reported that they could not obtain the required number of servings from the number of pieces packed. This also accounts for the initial continuous overrun on chicken products. Packaging procedures were changed to weight rather than piece, and greater satisfaction and more realistic production yields were achieved. The processing of frozen chicken resulted in the bones turning dark and presenting an unappetizing appearance. Fresh, cut-up chicken overcame this problem. Therefore, authority was requested to locally purchase fresh, cut-up chicken for purposes of this evaluation. A blanket purchase agreement was obtained, and fresh chicken is now used for production.

(3) Ground Beef and Beef Patties: Ground beef and beef patties were noted to have significant variance in fat content. Though it may only be a variance of two to three per cent, a definite difference was noted during mixing of meat loaves, Salisbury steaks and meatballs. The beef patties had a

difference in texture and cooking characteristics when used for chicken fried beef patties. Those items with the lower fat content provided a more acceptable finished product.

(4) Boneless Rolled Turkey: On two occasions it was noted that the boneless rolled turkey contained bone fragments.

(5) Natural Cheeses: High bacteria counts were detected in several shipments of cheese which resulted in their rejection and subsequent re-scheduling of Central Kitchen production.

(6) Chicken Flavored Soup and Gravy Base: The majority of the chicken soup and gravy base had a tendency to give a greenish appearance to the finished product. This was reported to TSA and NARADCOM.

(7) Roast: On several occasions when oven roast was requested there was a mixture of both dry and moist heat pieces of meat mixed in the box. This created a problem in selecting the proper cooking time and temperature.

(8) Bakery Mixes: The standard issue bakery mixes were noted to be of inferior quality for central production, especially after they were two or more years old. It was necessary to procure these items on local purchase order to receive a more acceptable commercial mix.

b. Container Sizes: Most container sizes are too small for efficient operations within the central facilities. Large volume containers, with few exceptions (flour, sugar, pie fillings) are not available through normal supply channels. Care must be taken, however, to ascertain the most effective size for almost each item, as savings realized in stockage of only large size containers could be offset by additional handling and storage required after breakdown.

c. Reaction time of the supply system has been adequate, however, long lead times greatly reduced production flexibility. Difficulties were encountered for those items which were to be procured locally through the Procurement Division. The requirement to receive separate authorization through TSA for each item which was to be procured locally extended the already long procurement time.

d. Packaging and packing practices used in industry for meat items designed as individual portions but recorded by weight on their shipping containers resulted in some confusion within the product breakdown area. With assistance from NARADCOM, changes to existing procedures resulted in simplification of weighing, handling and end item production.

9. Comments on Dining Facility Reconstitution Procedures and CFPP Operating Guides.

a. Reconstitution Procedures. Identifying and correcting problems with the reconstitution of products has been a joint effort between all divisions of DFM. The initial instructions for reconstitution of products required considerable experimentation, testing and changes. Some specific examples are:

(1) Pies: Reconstitution instructions required pies to be tempered for a minimum of three hours after removal from the freezer, baked for twelve minutes at 350°F, cut and served. The instructions had to be changed to include the requirement to allow pies to cool prior to cutting.

(2) Macaroni and Cheese, Lasagna and Related Items: Oven temperature and time had to be modified to eliminate burning of the produce on the sides and bottom of the pan, i. e., a lower oven temperature for the first twenty minutes, then raised to 325°F.

(3) During the evaluation of reconstitution procedures for Scalloped Potatoes, Macaroni and Cheese, and Chili Macaroni, more satisfactory results were achieved when the product was stirred during reconstitution. Specifically, when the product's outer edges reached 120°F the product was gently stirred from outside in. This blended the product, maintaining a more even temperature without overcooking.

b. Operational Guides. For the most part, operational guides provided by NARADCOM were acceptable after experience in their use was gained. These guides provided a good point of reference for initial startup. Numerous changes were required in ingredients and procedures. These changes were made based upon feedback from production personnel, sensory evaluation reports and consumer and SDF reports. The time table for this evaluation was such that there was no opportunity to fully test production runs of many items prior to going into full scale production. This created a problem of procedural requirements in many cases. Experience in the use of these guides taught numerous lessons such as adding starch products toward the end of the procedure to prevent sticking of the product.

c. Several production guides were identified as non-conducive to central preparation. These items were selected for non-production based upon one or more of the following reasons: Poor acceptability by the sensory evaluation panel, lack of demand, or a shortage of freezer space when a similar item

was available. A memorandum identifying these items was provided TSA. Examples of such are: Liver and Onions - the liver turned green when re-constituted; El Rancho Stew - because of limited freezer space and availability of a similar product (Beef Stew), this item was not produced; Bacon Wrapped Cheese Stuffed Frankfurter - cheese totally melted before bacon was slightly cooked.

d. A continuous problem of actual yield versus anticipated yield was encountered. For the most part these problems were identified as production problems which were correctable. For example, it was discovered in May 1978 that the kettles on the kettle bank were canted and not level. This caused a difference in volume measurement depending on which side of the kettle the readings were taken. As a further example, a continuous overrun was being experienced in cake mixes being processed through the cake depositor. It was discovered that machine vibration caused the machine setting to change during production. Consequently, the pans were filled at a decreasing weight resulting in an apparent excess.

e. The production guides were based on one hundred servings of product and then a straight line projection of each ingredient was used to arrive at the various different batch sizes. Large volume production of certain items revealed that such straight line projection is not appropriate in all cases, especially with seasonings. It is suspected that several spices, such as cayenne pepper, should increase at a decreasing rate when enlarging the batch size.

f. Copies of minutes of all meetings concerning operational guides were forwarded to TSA. Operational guide changes were noted in these minutes.

10. Adequacy of Present Dining Facility Equipment to Support CFPF Operations. Equipment generally available under the Dining Facility Modernization Program is sufficient to support the centralized food concept. Some modifications would greatly enhance the efficiency and productivity. These are discussed as follows:

a. Forced Air Convection Ovens. These items functioned well, particularly with small oven loads. When the oven was fully charged with dense, hard frozen product, a significant internal product temperature variation was noted dependent on their location within the oven. In some cases this required changing pan locations during reheating, or constant

monitoring to insure removal of pans when the proper temperature was attained. Recalibration of the ovens was required midway through the evaluation due to the fluctuation of time/temperature variables and differing oven construction. Ovens were opened several times during reheating to check temperatures and relocate pans. The addition of an internal thermocouple and temperature readout would greatly simplify monitoring the cooking process. The racks and dollies available for some types of ovens were not generally used, due primarily to the frequent movement and assessing of the oven contents. Had the racks and dollies been compatible with the warmers, much greater use would have resulted.

b. Food Warmers. As mentioned above, these items were not compatible with the oven loading and transport system. Internal rack configuration and shelf height restricted the loading capacity, therefore limiting their efficient use.

c. Steam Cookers. As evaluation continued, it appeared that more items could be reconstituted in the steamer with considerable savings in time. This was particularly important when fluctuations in headcount occurred. More adherence to progressive cookery techniques was possible with the cooker than with the ovens.

d. Freezer Storage. With the addition of the 800 cubic foot freezer, capacity was adequate when all equipment was functioning. On several occasions freezers malfunctioned, causing major problems in relocation of large quantities of frozen product, or increased frequency of delivery. Flexibility was severely restricted by the almost total reliance upon the limited available freeze capacity in each dining facility. The correct warehousing of freeze items within the walk-in boxes was complicated initially by a lack of adequate shelving. This was generally overcome as the evaluation progressed. (Through advance planning, during renovation of several of the dining facilities, indoor location of the freezers was possible. Conversion of refrigerated storage to freeze, and addition of an adjacent box for refrigerator storage, greatly simplified operations.

11. Requirements for Training and the Advantages and Disadvantages of Rotating Military Food Service Personnel Between the CFPF and SDF's for Training.

a. The requirement for a training program for military food service personnel for the maintenance of job proficiency is recognized as with other military occupational specialties (MOS). This applies to food service personnel performing duty in a dining facility supported by a CFPF as well

as performing duty in a dining facility which is not CFPPF supported. The training program must be designed to enable the individual to perform at a high level of proficiency in the event of mobilization, but should, also, address training needs pertinent to his particular job in a peace time, garrison environment. This dual training requirement is particularly applicable to cooks. Although food preparation utilizes essentially the same methods and techniques in garrison as well as in the field, the differences in equipment and (in many instances) in the type ration served, requires different training programs. Practical proficiency training for mobilization/wartime situations is normally accomplished by requiring cook personnel to perform their duties in a field situation using field type equipment and methods, and preparing rations designed for field feeding. Training for their garrison duty is accomplished by an on-going on-the-job training program administered by the food service sergeant and/or food adviser and designed with garrison feeding requirements in mind.

b. A concern expressed by some individuals is that military cooks would lose the proficiency of food preparation while under a CFPS. Although it is true that a significant number of menu items would no longer be prepared in the dining facility, particularly those items that are labor intensive to prepare, a great number of food items would still have to be prepared by the cooks in the facility. Most breakfast and short order items are not conducive to central preparation, freezing and reheating. These must be prepared in the facility. The same is true of vegetables, which are prepared for the most part by the cooks in the dining facility. In the case of pastry and other CFPPF supported items, this could be accomplished by:

(1) Serving an A-Ration meal prepared totally in the dining facility three or more times a month, as is now done with the B-Ration components which must be rotated.

(2) Conducting demonstrations by senior food service personnel on entree and pastry preparation on a periodic basis, followed by practical work performed by cook personnel.

(3) Rotating personnel through food service school as they progress in their career similarly as is done in the British Army Catering Corps.

c. Although it may be premature to so state, nevertheless, it is considered unlikely that a CFPS, even if approved for proliferation to other installations, would be established at every military installation world-wide. Any training shortcomings experienced at an installation under CFPS could probably

be made up during a subsequent assignment to an installation not under the CFPS. A similar condition exists today with cook personnel assigned to TDA organizations. Normally, TDA personnel seldom go to the field. Therefore, proficiency in field cooking operations is not maintained during their TDA assignment. This is usually corrected by an individual experiencing a mix of assignments with both TDA and TOE type units.

d. Advantages and Disadvantages of Rotating Military Food Service Personnel Between the CFPF and SDF's:

(1) Advantages:

- (a) Familiarization with new, state of the art, high production food preparation equipment.
- (b) Training in preparation of items not produced in the SDF.
- (c) Learn new and/or different food production techniques.
- (d) Enhance career/professional development by exposure to centralized food preparation operations.

(2) Disadvantages:

- (a) The best people would not always be preparing the food centrally for distribution to all other dining facilities.
- (b) The training cycle in the CFPF would have to be lengthy in order to familiarize rotation personnel with the operation of all equipment, and for these individuals to be productive while at the CFPF.
- (c) Cooking procedures learned in the CFPF could be detrimental upon their return to the dining facility (e.g., the practice of undercooking foods).

e. The rotation of personnel through the central facilities was not possible during the short evaluation period. This was due to the requirement for at least thirty to sixty days training time in order for the individual to be sufficiently familiar with equipment and procedures to make a significant contribution. In addition, the limited number of personnel available to DFOD did not permit the continuous rotation of personnel. In order to rotate all military food service personnel at Fort Lee, a minimum of six per month would have had to participate in the rotation. This quantity of turbulence would be disruptive to production in both the SDF's and the Central Kitchen.

12. Apparent Advantages/Disadvantages of Direct Hire KP's Versus Contract KP's for Operating a CFPS. The following comments pertain to KP's performing duty within the CFPD:

a. Direct Hire KP's - Advantages:

(1) Same work force in the facilities each day which would facilitate specialized training in the operation of specific items of equipment.

(2) Work force under direct supervision of the individual in charge of the facility; direct communication with the employees.

(3) Better esprit among the work force by always knowing what their individual jobs are and where they would be located (as opposed to being shifted around from one job or location to another).

b. Direct Hire KP's - Disadvantages:

(1) If employee is absent, there is no replacement to do that person's work.

(2) Administrative actions pertaining to employees is the responsibility of the supervisor; time consuming and not directly related to production.

c. Contract KP's - Advantages:

(1) Supervision of employees performed by contractor; more time made available to supervisor for other duties.

(2) Contractor responsible for training of personnel and insuring sufficient personnel are always present to perform the required tasks.

d. Contract KP's - Disadvantages:

(1) Specialized work to be performed would require the contractor to have several employees so qualified; would be costly to contract for.

(2) No direct supervision of employees authorized by the supervisor in charge of the facility. All such coordination must go through the contractor's representative or the contractor himself.

(3) All work to be performed must be included in the contract specifications; difficult to get employees to perform required tasks which are not in the contract; no direct operational control over the employees.

e. The stringent controls and limitations imposed by MACOMS and DA on manpower make it extremely difficult for the Installation Commander to employ the number of civilian personnel required in SDF's to accomplish assigned missions. Since 1970, TSA has been able to develop and refine contract specifications and standards for accomplishing the KP function. The success of such actions is attested by the recent presentation of the Philip A. Connelly Award for excellence in food service to a dining facility operated by a contract.

f. In view of the foregoing, serious consideration should be given to converting the KP function at Fort Lee to a contract type function.

13. Equipment Performance, Including Preference, Shortcomings, Ease of Operation and Reliability. A complete listing of equipment used in the central facilities is attached as Inclosure 7 (TAB G). Unless equipment items are discussed below, they are considered adequate for operations within central facilities. Following is a listing of equipment which is unreliable, difficult to operate, or not recommended for future use:

a. Item 3 - Food Preparation Table - The food preparation tables received through the supply system were not sturdy enough to withstand the use required within the Central Kitchen. It was necessary to weld braces to the legs and top to add additional strength.

b. Item 6 - Mixing Machine, Blakeslee - There are two of these mixers installed in the Central Kitchen. The operation of these items has been overall satisfactory with the exception of the attachments. Repairs have been a constant problem on the yoke for attaching the paddles and on the neck of the paddles and dough hook. On several occasions, these items have broken off when placed under normal stress.

c. Item 10 - Bowl, Lifting and Pouring Truck - This was an excellent piece of equipment. The only shortcoming was it would not raise high enough to reach the pie filling depositor or the cake and cookie depositors.

d. Items 13 and 14 - Hot Plate and Mixing Machine - These two items were not required for large production and are not recommended for future use.

e. Item 17 - Icing Depositor - The equipment was easy to operate and functioned well; however, for the level of production in this facility, it was oversized. It was less labor and time consuming to ice the cakes by hand than it was to use the icing depositor and expend the manhours to clean the machine.

f. Item 18 - Sweet Roll Production Table - This piece of equipment operated very well. It is suggested that future procurements include all accessory parts at time of initial procurement rather than piecemeal as was done with this facility.

g. Item 19 - Dough Dividing and Rounding Machine - There was no occasion where this piece of equipment was required.

h. Items 25 and 26 - Pie Machine and Pie Filling Depositor - These pieces of equipment operated reasonably well. The filling depositor required frequent maintenance and adjustment. The capacity of these machines was too large for this facility. The rated capacity should be more closely associated with the expected production level for future kitchens.

i. Item 28 - Doughnut Machine - As with the pie machines, this piece of equipment operated with no great problems. It also was oversized for the level of production in this facility.

j. Items 30, 30A and 30B - Bag Sealer, Bag Loader and Packaging Conveyor - These pieces of equipment were not used during the evaluation period. The items were positioned in a poor location, and NARADCOM had to spend considerable time getting the machines operational and designing the proper size bags. At the time of this report, the bags have yet to be delivered from the manufacturer.

k. Item 31 - Revolving Tray Ovens - These pieces of equipment operated with little difficulty. It was necessary to have the shelves balanced about every six months. These items were adequate for both entree and dessert production. However, for future operations, a traveling or continuous oven is recommended for dessert operations.

l. Item 32 - Convection Ovens - These two pieces of equipment never worked properly. Neither the equipment manufacturer's representative nor the maintenance contractor could get the air flow properly adjusted to allow

for even heating and browning of all products in the CFPF. It was satisfactory for large items such as roasts and sheet cakes, but was not satisfactory for cookies or other small individual items. Future operations should consider a combination of special meat roasting ovens and revolving tray ovens.

m. Item 40 - Breeding Machine - The breeding machine purchased for the CFPF was a drum-tumbler type. This type was totally unsatisfactory for breeding any flat type of product such as swiss steak or beef patties. A new conveyor type breeder (Stein, Model E-8) was procured and received in late September 1978. At the time of this report, it is too early to submit an evaluation of this piece of equipment. After approximately four production runs using this machine, it is obviously superior to the original breeding machine. It requires a certain minimum density to the breeding material used, however, or else it will not convey the unused breeding back up through the machine for reuse. Also, there is no variable speed control on this machine, which would be advantageous to have since it must work in conjunction with other conveyor systems of other equipment; i. e., continuous fryer, etc.

n. Item 41 - Automatic Fryer - This piece of equipment performed its required function very well. The problems experienced with this piece of equipment were improper exhaust and ease of cleaning. The exhaust vents were inadequate for this machine; an overhead exhaust hood was required. To clean the machine it was necessary to lift the conveyor out of the fryer. This was done by using an overhead hoist. The hoist was stationary, which created the problem of moving the conveyor out of the way once it had been lifted.

o. Item 46 - Kettle System -

(1) This item has provided numerous problems most of which have yet to be corrected. The major problem remaining is the inability to adjust cooking temperature for individual products. The controls should be by each kettle where adjustments can be made while the worker is observing the product. The design of the kettles and agitators is such that a product is not stirred but instead is just moved around the kettle. This has caused the requirement to stir all products by hand. The agitators should be designed to adequately stir and scrape the sides and bottom of the kettles. There is a definite requirement for some type of basket designed to fit into the kettles for cooking items which must be removed immediately from boiling water. In addition, a screen type cover is required to permit straining or removing excess liquids from products while in the kettle. At present, there is no

efficient method of draining excess fat or liquid as required by the operational guides. NARADCOM is working on a stainless steel screen to fit over the top of the kettles to permit drainage.

(2) The kettles are all supported on a common frame with no way of leveling the individual kettles. This has caused a problem in volume measurement. The volume reading depends upon the side of the kettle from which the reading is being taken. In some cases, there is a difference of eight to ten gallons between different sides of the kettles.

(3) The kettle system was designed to pass chilled water through the kettle jacket and cool a product down to a lower temperature. However, it takes approximately two hours of constant chilling and product agitation before the product is cooled. This length of time is, in most cases, detrimental to the quality of the product.

(4) Future operations should use single mounted and controlled kettles in an elevated position rather than in the configuration now in use. Elevated kettles would permit gravity transfer rather than the pumping system presently installed.

p. Item 48 - Tank Cooler - This piece of equipment operated satisfactorily with one exception - a more reliable and accurate temperature control device is required. It was difficult to control water temperature at the desired level. This piece of equipment could easily be converted for other uses, such as cooking noodles, if a wire mesh basket were available.

q. Items 52 and 53 - Chilled Water Pump and Ice Builder - These items worked satisfactorily except the drainage system was not adequate to support this system if two or more kettles were being cooled at one time. It is recommended future operations having a cooling system where the product is cooled during transfer from the kettle area to the packaging area rather than in the kettles.

r. Item 55 - Meat Slicer - This particular slicer presented sanitation problems. The conveyor, if the slightest bit marred, harbored bacteria and was a constant cleaning problem. It became necessary to require a complete cleaning after every twenty minutes of operation. A more adequate slicer would be a heavy industrial slicer similar to that used for slicing bread, only designed for slicing meats.

s. Items 56 and 57 - Packaging and Portioning Conveyor and the Food Pump and Transfer Assembly - As of the time of this report, these systems had not been evaluated.

t. Item 50 - Blast Tunnel Freezer - As of the submission of this report, the Baker-Perkins blast freezer has functioned very well and consistently exceeded its rated through put. A recent inspection of the compressor, however, by the maintenance contractor revealed that this component required extensive replacement of parts or complete replacement of the compressor. It was determined to be less expensive to replace the entire compressor. The compressor was ordered and has been delivered.

u. Item 61 - Filling Bench - This item was never purchased.

v. Item 63 - Walk-in Freezer - This was adequate for the needs of the Central Kitchen except in those instances where the TISA was short of storage space and would not accept shipment from the Central Kitchen. The only recognizable problem was in cleaning the floor. Future operations should insure it has a sealed floor which would permit easy and effective cleaning.

w. Item 66 - Can and Bottle Crusher - Though this item operated as designed, it did not have sufficient capacity for the amount of cans generated in the Central Kitchen.

x. Item 70 - Labeler - This piece of equipment was not fully tested as of submission of this report.

y. Can Openers - The can openers used were the same type of electric openers used in dining facilities. They performed satisfactorily; however, were too slow to meet requirements and would not last long under continuous heavy use. A system must be developed to handle the number of cans required in the Central Kitchen.

z. ISPB Item 11 - Vertical Cutter Mixer - Problems occurred in the form of contaminating products when this machine was used. The small teflon gasket has to be replaced frequently as it wears down and harbors bacteria. An inventory of these gaskets is maintained for replacement purposes.

aa. ISPB Item 13 - Vegetable Cutter and Slicer, Qualheim - This item can only be used for processing vegetables. In the initial stages of operation, it was also used for shredding ham and cheese. However, it was discovered that the cutting blades could not be adequately cleaned to prevent bacteria from growing and contaminating food.

bb. ISPB Item 17 - Hollymatic Meat Forming Machine - This item provided adequate support, but was very sensitive to product mix and temperature. If the product mix was too wet, either due to excessive fat or water content, the machine would not properly function. If the product mix was too warm where the fat content became soft and mushy, the machine would not function properly. These problems were overcome in most cases by assignment of one or two individuals to do all mixing in order to maintain the proper consistency.

cc. ISPB Items 4 and 5 - Lye Peeler - This system functioned well although its use is normally restricted to peeling potatoes. Based upon this usage, a steam peeler might be more efficient.

dd. ISPB Item 8 - Centrifuge - This item was replaced after three years of operation, with a like item.

ee. ISPB Item (added) - Urschel Slicer/Dicer - This late addition to the system is highly efficient and with the proper blade attachments will handle most food production requirements.

ff. ISPB Item (added) - Fairbanks Morris Electronic Scale - Far superior to the balance style previously used. Due to its measurement range (hundredths of a pound) a conversion chart was required to convert to ounces.

14. The Adequacies of Packaging.

a. The type and style of principal-use food containers selected for this food processing system was considered adequate although very restrictive in actual use. The selection of aluminum pans and paper/foil lids is more readily understandable in view of the economic situation which existed during the initial procurement of supplies and equipment for central food production. The inability to procure a packaging system compatible with containerization of liquids, i. e., soups, gravies, sauces, etc., complicated the production process. The packaging and portioning production line was designed to function properly only with one specific brand of disposable one-half size

aluminum steam table pan. This was discovered upon receipt of a different brand of pan, which ostensibly met the specifications. Unfortunately, these pans would not pass through the pan dispensers due to the configuration of the pan bottom. Difficulty also was encountered with incompatibility of the pans and lids during subsequent reorders. Although the pans with lids were acceptable for this operation, it appears that the state of the art in packaging now offers several less expensive and more efficient containers. If the packaging cost were to be added to that of the product as an expense to be included under the ARCS System, the number and type of items produced would be considerably restricted.

b. The use of the aluminum tray for dessert items was highly satisfactory after initial problems were resolved in heat transfer during the baking process. The system for the individual overwrap of each tray was cumbersome in that the automated bag forming equipment was not in use and all operations were done manually.

c. The adaptation of the packaging procedures to the circular pie pan was marginally acceptable. Overwrap of pies was particularly difficult and efficient use of the rectangular shipping containers was not possible.

d. The decision to use a fiberboard box with liner and fiberboard inserts for additional stacking strength greatly simplified handling once the product was overwrapped and manually packaged in the central kitchen. The change in concept from the reliance on wire baskets to the fiberboard container also resulted in improved product identification and labeling throughout the storage and distribution system. One drawback was that even though vertical liners were used, stacking strength was lost when containers were partially emptied and restacked, as was the case in the dining facilities.

e. The complete reevaluation of packaging requirements, to include processed produce, should be undertaken prior to any proliferation of the central production concept. It should be noted that no effort was made to recycle either the aluminum or fiberboard containers during this evaluation.

15. Waste Disposal Problems Incurred:

a. The major problem in waste disposal was that of grease from the doughnut machine and the continuous fryer. There were no arrangements for separate disposal, so the grease was frozen and placed in the dumpster in plastic bags just before dumpster pick up. This problem has been documented and referred to the Post Directorate of Facilities Engineering for resolution.

b. Disposal of cans generated in the Central Kitchen was a problem initially, due to the use of an undersized can crusher. A larger and faster can crusher is available and awaiting installation.

c. Waste water from the lye peeling operation is a possible source of problems which should be addressed prior to adoption of this system in future operations.

d. The recycling of aluminum and fiberboard containers was previously addressed.

16. Impact of the 42-Day Master Menu on CFPS Operations.

a. The requirement to adapt production to the 42-Day Menu cycle was the principal factor responsible for failure to achieve what was perceived as a "production mode". The multiplicity of items, many of a similar nature, which appeared only once or twice in a cycle were initially scheduled and produced. It became immediately apparent that this process, combined with the requirement to produce all items suitable for central production, including vegetables, starches, sauces, gravies, etc, would severely tax the support system, particularly in the areas of pre-production preparation and freeze storage. These small job lots frustrated the application of quality production techniques and ultimately resulted in a reappraisal of the requirement to adhere to the Master Menu.

b. Several items which appeared infrequently, i. e., once or twice during the cycle, were deleted from production due to the restriction of freezer storage space. A continuing review of menu items indicated the existence of a number of essentially identical products. In these cases those items most acceptable were retained and substituted as needed for the less acceptable similar items.

c. As was noted in the pilot evaluation in the summer of 1977 and through visits and conversations with other food service organizations in CONUS, few, if any, dining facilities produced their own pastry products in the profusion specified by the menu. Production would be greatly simplified through the selection of standardized highly acceptable pastry products and the occasional production of specialty items such as fruit cakes, hot cross buns, etc. The Installation Menu Board could adequately identify these requirements.

17. Shortcomings or Problems with the Physical Facility.

a. Although facilities were acceptable for the Interim CFPS, their configurations, construction and locations were not ideal. The ideal situation would be to have the Ingredient Preparation Facility, dessert preparation and entree preparation activities located in a building adjacent to a cold and dry storage facility. Within this facility, space should also be provided for a laboratory and the necessary office space for administrative and management personnel for the CFPS. Neither the ISPB nor the Central Kitchen had adequate storage or work space. The ISPB should have separate rooms for meat preparation and vegetable preparation, and for additional chill space, especially for the tempering of meat items. (This requirement could have been overcome had the Microwave Tempering Tunnel been installed.) The Central Kitchen should have had separate rooms for entree and dessert production. There was virtually no storage space for operating supplies or normal production supplies in either facility.

b. The Ingredient Preparation Facility was located in an old meat cutting plant adjacent to Troop Issue Subsistence Branch cold storage plant. Although this location was very ideal for the movement of perishable items into the ingredient preparation area, the old meat cutting plant's configuration did not provide the proper facilities to establish good work flow for the ingredient preparation task. Specifically, the facility was located approximately 200 yards from the Central Kitchen, and this caused ingredient handling and transportation problems. The shipment of prepared salads, and formed, uncooked meats for direct shipment to dining facilities, created, in some cases, cross-flow through the ingredient preparation area. The flooring in the Ingredient Preparation Facility was quarry tile, which was extremely slippery when wet and also the cause of many personnel injuries. The flooring under the Lye Potato Peeler was constantly wearing away by lye drippings. When the Lye Potato Peeler was installed, a floor which would be resistant to lye should have been installed and suitable drains to insure that the drainage of lye mixture would rapidly and safely occur. At the time the building was renovated, a pot and pan washer was not installed, therefore, pots and pans were washed by hand. The renovation of the facility to house the Ingredient Preparation Facility was accomplished with the view toward economizing wherever possible since this was intended only as an interim CFPF. Due to this, some undesirable features in the plant were not eliminated, such as overhead meat railings throughout the facility. These have created an unsanitary condition due to collection of dust and moisture.

c. The Central Kitchen was housed in a temporary World War II maintenance-type building, the interior of which was completely renovated; however, due to funds curtailment, air conditioning was not installed. Some large ventilation fans were installed to create a positive pressure in the interior, but these fans were detrimental to operations and sanitation inasmuch as the fans would blow dust, flour and fumes throughout the facility when in operation. During the summer period, the temperature within the Central Kitchen attained readings of up to 120°F, which was detrimental to health, welfare and morale of central food preparation personnel, and caused concern for food safety and effect on bakery products. The flooring in this facility is unsatisfactory. It is very slippery and numerous personnel injuries and accidents have occurred. The flooring was originally programmed to be of a non-skid, troweled-on epoxy variety, but due to the District Engineer's reduction in scope of work, the non-skid type flooring was "value engineered" out of the contract. In an effort to eliminate the slippery floor condition, a non-skid, epoxy type paint was applied. However, heavy carts and constant wear and tear wore away the paint within a very short time. A reapplication by the Post Engineers of a high abrasive industrial grade paint also failed to correct the problem. The walls were constructed of gypsum board coated with an epoxy paint. These withstood normal use; however, would not withstand the slightest bump without a hole being made. Permanent facilities must be constructed with walls able to take some abuse and which are easy to sanitize. The floor was sloped towards all floor drains. This caused a problem with equipment, tables and mobile racks, as they would not stay in position. The locking wheels were often not sufficient to prevent rolling. An increase in size of the Central Kitchen administrative office space is also considered necessary. This area and the employee break room should be better heated in the winter and air conditioned for the summer.

d. The Quality Control Laboratory was located in an existing building approximately one and one-half miles from the CFPF. This building was completely renovated and serves very well as a laboratory; however, the distance factor is somewhat of a problem inasmuch as samples have to be transported daily, which requires additional transportation and personnel to accomplish these tasks.

e. Modifications were made to the dining facilities to facilitate the storage, handling and reconstitution of centrally prepared food items, as discussed in Section IV, paragraph 13.

18. Maintenance.

a. The maintenance contract for CFPF, Buildings S-6220 and P-7118C, had the following requirements:

(1) Performance Requirements: Maintain, repair, service, adjust and calibrate all food processing equipment, refrigeration, plumbing, steam generated equipment and lines and electrical/electronic service, provide new parts and components, Buildings S-6220 and T-7118C.

(2) Preventive Maintenance: Inspection, detection, cleaning, lubricating, replacement of filters, etc.

(3) Corrective Maintenance: System testing, fault isolation, equipment, adjustments and alignments.

(4) Equipment Removal: Replacement US Government responsibility.

(5) Contract Period: 25 November 1977 to 30 September 1978.

Cost: Labor - \$220,790; Parts - \$30,000.

Contract Period: 1 October 1978 to 30 September 1979.

Cost: Labor - \$170,102; Parts - \$75,000 estimate.

b. The contractor performing the maintenance of the equipment provided adequate and responsive service. There were no breakdowns of equipment or delay of repairs which caused a loss to the government due primarily to the on-site maintenance team and an effective preventive maintenance program. The ability of the contractor to furnish parts for repairs was most beneficial, as he could contact equipment manufacturers directly. The ability of the Army supply or procurement system to respond as quickly would require a large inventory of spare parts to adequately support the one-of-a-kind specialized equipment.

c. Based upon experience with both in-house and contract maintenance, the contract approach was most beneficial from the operator's point of view.

SECTION V

CONCLUSIONS

1. The evaluation of the CFPS was conducted prior to the attainment of a "steady state" of operations.
2. Major elements of the CFPS concept as relate to production and SDF activities require reevaluation:
 - a. Adherence to the 42 Day Master Menu.
 - b. Reliance on the Army Supply System and use of current specification items.
 - c. Expected usage of centrally prepared products as relate to management flexibility in SDF's.
 - d. Establishment of a demand versus menu controlled production system.
 - e. Reappraisal of tasks performed by cook personnel in the dining facility.
 - f. Need for a product development capability.
3. The minimum level of food production and technology skills, particularly in the Central Kitchen and Technical Support Office, greatly impacted upon food production. Lack of requisite skills limited the problem solving capability much needed during the start-up and initial production period. Quality control functions were assumed by the production staff in the absence of other qualified personnel.
4. Organizational Staffing:
 - a. Staffing inadequacies were found in the Central Kitchen, Office of the Chief, and ISPB. A Food Technologist is required full time in the Office of the Chief, a branch chief position in the grade of Chief Warrant Officer

(MOS 941A) or GS-11, Industrial Specialist, is required in the ISPB, and an additional floor supervisor is required in the Central Kitchen. More flexibility is required in the employment and scheduling of the food production staff.

- b. Staffing is adequate in the TISA to support CFPS.
- c. Staffing was not adequate in the SDF's to support CFPS.
- d. Additional staffing is required in TSO.

5. The planning, scheduling and control system was not adequate to guide central production due primarily to lack of automation, and the inability of the manual system to react to initial over-production, long lead times for supply reorders, due-outs and unsatisfactory substitutions. The lag time between Menu Board decisions, production forecast, supply requisitions, production scheduling and actual production was in some cases over sixty days. Therefore, modification of any of the myriad factors affecting the production cycle was not apparent in either the type or quantity of finished product until long after initial change was instituted. Failure to recognize this aberration resulted in the appearance of inefficiency and, in some instances, of over reaction based on changing requirements.

6. The layout and design of the Central Kitchen, although adequate in light of the relocation and reengineering requirements, allowed a greater percentage of space for dessert production than necessary, at the expense of entree preparation.

7. Individual large capacity food production equipment items selected for testing in the Central Kitchen were not integrated into a system which allowed the user to capitalize on their capability. A high degree of manual effort was required to support any operation in at least one stage of production. Without the ancillary transport and handling equipment, any evaluation is at best marginal.

8. The packaging system and techniques actually employed in the CFPS was marginally satisfactory. The Pure-Pack machinery was not available for packaging of fluid products. Problems were encountered in the supply of aluminum containers and lids, due primarily to inadequate specifications, and bags for dessert items.

9. The assumption that production guides could and would be methodically reviewed and modified to meet the special needs of the CFPS did not recognize the extensive nature of this task. This function was performed primarily by the production staff, applying the skills attained in traditional military food service activities. A program and staff is required to perform this function.

10. The ISPB as an entity appears to be a cost efficient operation in support of dining facility requirements for salads, salad ingredients, processed meats (including shingled bacon) and natural cheeses.

SECTION VI

RECOMMENDATIONS

1. In light of the considerable additional requirements needed to bring the CFPS into a steady state of production, and the limited prospects for a commensurate increase in critical data which would measurably affect the overall outcome of the evaluation, it is recommended that the CFPS be terminated.
2. That the ISPB, divested of its support requirements for Central Kitchen production, be reviewed as an entity for possible implementation at other installations.

7 Incl

1. TDA dtd 12 Jan 77 (TAB A)
2. Original TDA (TAB B)
3. TSO Quality Index Rating (TAB C)
4. Cook Staffing Requirements (TAB D)
5. Cook Personnel - Recommended by
TSA Food Mgt Asst Team and
TRADOC Manpower Survey (TAB E)
6. Servings Produced in CFPF (TAB F)
7. CFPF Equipment List (TAB G)
8. Meals Served in Dining Facilities (TAB H)

DEPARTMENT OF DEFENSE
SECTION II: O
T.A. Proposed TDA

DATE 12
T.A. Proposed TDA

STATION OF CHANGE

DESCRIPTION	GRADE	POS	EX	STRUCTURE	REC	AUTO	RMA
OFFICE OF DIRECTOR							
DIRECTOR	05	0082A	QM	C On board	1		
PROGRAM MANAGER	13	00340	GS	C On board	1		
SECY STENO	06	00318	GS	C On board	1		
					3		
TECH SPT OFC							
SUPV FOOD TECH	12	01382	GS	C 1 Mar 77	1	Minus 1-Se	
SANITATION SUP	07	01860	GS	C 1 Mar 77	1		
FD SVC WORK LDR	02	07408	WL	C 15 Mar 77	2		
JANITOR	02	03566	WG	C 15 Mar 77	6		
NOTE: QC/MICRO pers assigned to Ft Lee MEDDAC					10		
SUPPORT DIV							
CHIEF	11	00341	GS	C On board	1		
OPNS/TNG OFF	03	04114	QM	C On board	1		
BUDGET ANALYST	09	00560	GS	C On board	1		
LOG SUPPORT OFF	09	00301	GS	C On board	1		
SUPPLY CLK	05	02005	GS	C On board	1		
CLK STENO	04	00312	GS	C On board	1		
MOTOR VEH OP	05	05703	WG	C On board	1		
WHSMAN	04	06907	WG	C On board	2		
					9		
TROOP ISSUE SUBS BR							
CHIEF	10	02001	GS	C	1		
SUPV ACCTS MAINT CLK	07	00520	GS	C	1		
ACCT MAINT CLK	05	00520	GS	C	1		

Incl 1 pp 1 to annex D

DEPARTMENT OF DEFENSE DISTRIBUTION AND ALLOWANCE

DATE: 12 Jan 77

TDA Proposed TDA for DEM

TOA ☐ MTOA ☐

DESCRIPTION	GRADE	PCS	RR	ARMY MGT STRUCTURE CODE	REQ	AMTH	RRR
SUPPLY CLERK (RQNS)	05	02005	GS	C	2		
ACCT MAINT CLERK	04	00520	GS	C	1		
SUPPLY CLERK	04	02005	GS	C	1		
CLERK TYPING	03	00322	GS	C	1		
SUPPLY CLERK (TYPING)	03	02005	GS	C	2		
WHSMN FMN	09	06907	WS	C	1		
WHSMN FMN	06	06907	WS	C	1		
WHSMN FMN	05	06907	WS	C	2		
MOTOR VEH OP (HVT)	08	05703	WG	C	2		
MOTOR VEH OP (LT)	06	05702	WG	C	1		
Motor Veh Op (LT) (PPT)	06	05703	WG	C	1		
WHSMN	06	06907	WG	C	5		
WHSMN FLFT OP	06	06908	WG	C	3		
WHSMN (PPT)	04	06907	WG	C	3		
					29		
DEN FAC OPNS DIV							
CHIEF	03	0082C	QM	O	1		
FD SVC TECH	WO	941A0		P On board	1		
NCOIC	E8	94B50	NC	E On board	1		
FD SVC SGT	E7	94B40	NC	E	8		
FIRST COOK	E6	94B30	NC	E	8		
SR COOK	E5	94B20		E	16		
COOK	E4	94B10		E	11	Times 4-Oct'	
COOKS APPR	E3	94B10		E	2		
CLERK	E3	71B10		E	8		
COOK LDR	08	07404	WL	C	8		

Incl 1 pp2 to Annex D

TSA Proposed TDA for DFL

		GRADE	MOB	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	Run
04	1	COOK	08	07404	WG	C	12	Minus	6-Oct
	2	COOK	05	07404	WG	C	19	Minus	6-Oct
	3	FD SVC WORKER (PPT)	01	07408	WG	C	114	Minus	9-Oct
							209		184
05	0	CEN FOOD PREP DIV							
	1	CHIEF	04	0082B	QM	O	On board	1	
	2	INDUSTRIAL ENGR (PRODUCTION)	12	00896	GS	C	15 Dec 76	1	
	3	ACCTS MAINT CLK	05	00520	GS	C	1 Mar 77	1	
	4	SECY STENO	05	00318	GS	C	On board	1	
							4		
05	0	ING SCALING & PREP BR							
	1	NCOIC	E8	94B50	NC	E	1 Dec 76	1	
	2	COOK LDR	08	07404	WL	C		1	
	3	FIRST COOK	E6	94B30		E	1 Dec 76	1	
	4	SENIOR COOK	E5	94B20		E	1 Dec 76	1	
	5	COOK	E4	94B10		E	1 Dec 76	2	
	6	COOK (PPT)	05	07404	WG	C		1	
	7	FD SVC WORKER (PPT)	03	07408	WG	C		1	
	8	FD SVC WORKER (PPT)	02	07408	WG	C		2	
							10		
05	0	CENTRAL KITCHEN BRANCH							
	1	IND SPEC	11	01150	GS	C		1	
	2	NCOIC	E8	94B50	NC	E	1 Mar 77	1	
	3	FIRST COOK	E6	94B30		E	1 Mar 77	1	
	4	SR COOK	E5	94B20		E	1 Mar 77	2	
		Incl 1 pp3 to Annex D -							

52 1 Jan 77

		TSA Period: TDA		DATE 12 Jan 77		YDA <input type="checkbox"/> MDA			
		GRADE	MOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AMTH	AV
05	COOKS APPR	E3	94B10		E	1 Mar 77	2		
06	BAKER LEADER	08	07402	WL	C		1		
07	BAKERS	08	07402	WG	C		2		
08	BAKERY WORKER	05	07402	WG	C		2		
09	COOKS	05	07404	WG	C	1 Mar 77	3		
10	FD SVC WORK LDR	02	07408	WL	C		1		
11	FD SVC WORKER (PPT)	02	07408	WG	C	1 Mar 77	7		
12	WHSMN	04	06907	WG	C	1 Apr 77	2		
							25		
Incl 1 pp4 to Annex D									

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO.	
SECTION II ORGANIZATION										DATE	
DESIGNATION: FT LEE DEN(P)										TDA <input checked="" type="checkbox"/> MTDA <input type="checkbox"/>	
BASE FOR COMPUTATION OF CHARGES 9000 MEALS W/CPPE											
INDEX		DESCRIPTION	GRADE	MOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RMK	
PAN #	LINE #										
01	00	OFFICE OF DIRECTOR									
	01	DIRECTOR	05	04114	QM	0		1			
	02	PROGRAM MANAGER	13	00340	GS	C		1			
	03	SECY STENO	06	00318	GS	C		<u>1</u>			
		TOTAL						3			
02	00	TECHNICAL SPT OFC									
	01	SUPV FOOD TECH	12	01382	GS	C		1		*	
	02	CLERK-TYPIST	03	00322	GS	C		<u>1</u>		*	
		TOTAL						2			
02A	00	QUAL CON/MICRO BR									
	01	SUPV FOOD TECH	11	01382	GS	C		1		*	
	02	PREV MED INSP SP	E7	91S40		E		1			
	03	VET SPEC	E6	91R40		E		1			
	04	VET SPEC	E5	91R40		E		1		*	
	05	MICROBIOLOGIST	11	00403	GS	C		1		*	
	06	BIO LAB TECH	07	00404	GS	C		1			
	07	BIO LAB TECH	05	00404	GS	C		<u>2</u>		*	
		TOTAL						8			
02B	00	INTERNAL SANITATION BR									
	01	SANITATION SUPV	07	01860	GS	C		1		*	
	02	FD SVC WORK LDR	02	07408	WL	C		2		*	
	03	JANITOR	02	03566	WG	C		<u>6</u>		*	
		TOTAL						9			
03	00	SUPPORT DIV									
	01	CHIEF	12	00341	GS	C		1			
Incl 2 ppl to Annex D											

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO	
SECTION II - ORGANIZATION										DATE	
DESIGNATION: FT LEE DFM(P)										TDA <input checked="" type="checkbox"/> MTDA <input type="checkbox"/>	
BASE FOR COMPUTATION OF CHANGES: 9000 MEALS W/CFPF											
INDEX		DESCRIPTION	GRADE	MOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RVA	
PAR #	LINE #										
03	00	CONTINUED									
	02	OPERATIONS/ING OFF	03	04114	QM	0		1			
	03	MGT ANALYST	09	00343	GS	C		1			
	04	BUDGET ANALYST	09	00560	GS	C		1			
	05	COST ANALYST	07	00560	GS	C		1			
	06	CLERK-STENO	04	00312	GS	C		1			
	07	CLERK-TYPIST (PERS)	04	00322	GS	C		<u>1</u>			
		TOTAL						7			
03A	00	PROP & MAINT BR									
	01	CHIEF	09	02001	GS	C		1			
	02	PROP BK CLK	05	02005	GS	C		1			
	03	PROP BK CLK	04	02005	GS	C		1			
	04	WAREHOUSEMAN	04	06907	WG	C		2			
	05	WAREHOUSEMAN (PPT)	04	06907	WG	C		<u>1</u>		TERM IN 1 YR	
		TOTAL						6			
03B	00	TROOP ISSUE SUBS BR									
	01	ACCOUNTABLE OFF (STOCK FUND)	09	02001	GS	C		1			
	02	ACCTS MAINT CLK	05	00520	GS	C		1			
	03	STAT CLK	05	01531	GS	C		1			
	04	EATION CLK (REQN)	05	02005	GS	C		2			
	05	CLK TYPIST (SUPPLY)	03	00322	GS	C		2			
	06	WHSN FNN	09	06907	WS	C		1			
	07	WHSN FNN	06	06907	WS	C		1			
	08	WHSN FNN	05	06907	WS	C		2			
	09	TRUCK DRIVER	08	05703	WG	C		2			
	10	WHSN FNN	06	06907	WG	C		6			
Incl 2 pp2 to Annex D											

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO.	
SECTION II - ORGANIZATION										DATE	
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BASE FOR COMPUTATION OF CHARGES: 9000 MEALS W/CFPF											
INDEX		DESCRIPTION	GRADE	NOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RMK	
PAR #	LINE #										
03B	00	CONTINUED									
	11	WHSMN FLFT OP	06	06907	WG	C		3			
	12	WHSMN	04	06907	WG	C		2			
	13	SUPPLY CLERK (PPT)	02	02005	GS	C		1			
	14	CARD PUNCH OP (PPT)	02	00356	GS	C		1			
		TOTAL						26			
04	00	DINING FAC OPNS DIV									
	01	CHIEF	04	04114	QM	O		1			
	02	FD SVC TECH	WO	941A0		P		1			
	03	NCOIC	E8	94250	NC	E		2			
	04	FD SVC SGT	E7	94B40	NC	E		9		XK	
	05	FIRST COOK	E6	94B40	NC	E		9		XK	
	06	SENIOR COOK	E5	94B20		E		13		XK	
	07	COOK	E4	94B20		E		13		XK	
	08	COOK'S APPR	E3	94B10		E		2		XK	
	09	CLERK	E3	71B20		E		3			
	10	CLERK-TYPIST	04	00322	GS	C		1			
	11	COOK LEADER	08	07404	WL	C		9			
	12	COOK	08	07404	WG	C		41		#26	
	13	COOK	05	07404	WG	C		3			
	14	FD SVC WORK LDR (PPT)	02	07408	WL	C		18			
	15	FD SVC WORKER (PPT)	02	07408	WG	C		18		#9	
	16	FD SVC WORKER (PPT)	01	07408	WG	C		45		#47	
		TOTAL						189			

Incl 2 pp 3 to Annex D

DA Form 2152, 1 Jan 79

REPLACES PREVIOUS EDITION WHICH IS OBSOLETE.

PAGE 3 OF 8 PAGES

For use of this form, see AR 310-49; the proponent agency is ACSFOR.

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO.
SECTION II - ORGANIZATION										DATE
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BASE FOR COMPUTATION OF CHARGES 9000 MEALS/CFPF										
INDEX		DESCRIPTION c	GRADE d	MOS e	BR f	ID g	ARMY MGT STRUCTURE CODE h	REQ i	AUTH j	RMK k
PAR a	LINE b									
05	00	CENTRAL FOOD PREP DIV								
	01	CHIEF	04	04114	QM	O		1		
	02	INDUSTRIAL ENGR (PRODUCTION)	12	00896	GS	C		1		
	03	DIETITIAN (PROD PLAN)	09	00630	GS	C		1		
	04	SECY STENO	05	00318	GS	C		1		
	05	ACCTS MAINT CLK	05	00520	GS	C		1		
		TOTAL						5		
05A	00	INGREDIENT PREP BRANCH								
	01	SUPV FOOD TECH	12	01382	GS	C		1		*
	02	NCOIC	E8	94240	NC	E		1		*
	03	SECY STENO	04	00318	GS	C		1		*
		TOTAL						3		
05B	00	INGREDIENT SCALING SEC								
	01	COOK LEADER	E5	94B20		E		1		*
	02	FD SVC WORKER (PPT)	03	07408	WG	C		1		*
		TOTAL						2		
05C	00	VEGETABLE & SALAD PREP SEC								
	01	FOOD SVC WORK LDR	05	07408	WL	C		1		
	02	COOK	E4	94B20		E		2		
	03	FD SVC WORKER (PPT)	03	07408	WG	C		1		
		TOTAL						4		
05D	00	MEAT PROCESSING SEC								
	01	SENIOR COOK	E5	94B20		E		1		*
	02	FD SVC WORKER (PPT)	02	07408	WG	C		2		*
		TOTAL						3		
		Incl 2 pp 4 to Annex D								

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO.	
SECTION II - ORGANIZATION										DATE	
DESIGNATION FT LEE DFM(P)										TDA <input type="checkbox"/> MTD <input type="checkbox"/>	
BASE FOR COMPUTATION OF CHARGES 9000 MEALS/CFPF											
INDEX		DESCRIPTION	GRADE	MOS	GR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RMK	
PAR	LINE										
a	b	c	d	e	f	g	h	i	j	k	
05E	00	CENTRAL KITCHEN BR									
	01	CHIEF	03	04114	QM	O		1			
	02	INDUSTRIAL SPEC .	11	01150	GS	C		<u>1</u>			
		TOTAL						2			
05F	00	MAIN KITCHEN SEC									
	01	NCOIC	E7	94B40	NC	E		1		*	
	02	SENIOR COOK	E5	94B20		E		2		*	
	03	COOK'S APPRENTICE	E3	94B10		E		2		*	
	04	COOK	05	07404	WG	C		<u>4</u>		*	
		TOTAL						9			
05G	00	DESSERT PREP SEC									
	01	CHIEF PASTRY COOK	08	07402	WL	C		1			
	02	PASTRY COOK	08	07402	WG	C		4			
	03	FD SVC WORKER (PPT)	02	07408	WG	C		<u>1</u>			
		TOTAL						6			
05H	00	PACKAGING SEC									
	01	FD SVC WORK LDR	05	07408	WL	C		1		*	
	02	FD SVC WORKER (PPT)	02	07408	WG	C		<u>4</u>		*	
		TOTAL						5			
05I	00	EQUIPMENT WASH SEC									
	01	FD SVC WORK LDR	02	07408	WL	C		1		*	
	02	FD SVC WORKER (PPT)	02	07408	WG	C		<u>1</u>		*	
		TOTAL						2			
05J	00	GEN REC, STOR & DIST BR									
	01	CH	08	06907	WS	C		1		*	
		Incl 2 pp 5 to Annex D									

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES
SECTION II - ORGANIZATION

TDA NO.
DATE

DESIGNATION DFM(P)

CASE FOR COMPUTATION OF CHANGES 9000 MEALS W/CFPF

TDA ☒ MTDA ☐

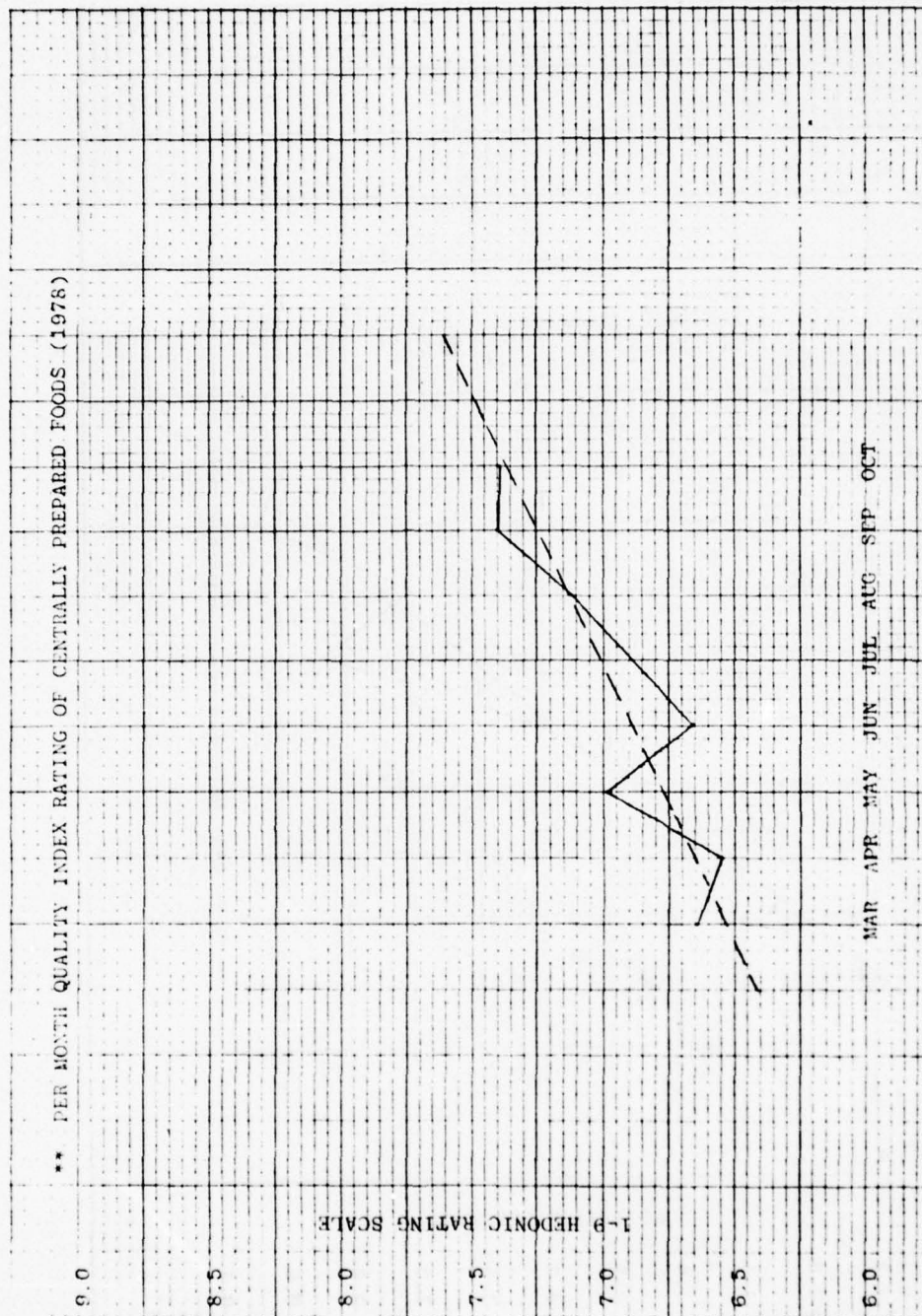
INDEX		DESCRIPTION	GRADE	MOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RMK
PAR	LINE									
A	B	C	D	E	F	G	H	I	J	K
05J	00	CONTINUED								
	02	KEYPUNCH OP	03	00356	GS	C		1		
	03	TRUCK DRIVER	06	05703	WG	C		3		*1
	04	WHSMN	04	06907	WG	C		2		*
		TOTAL						6		
----- AUGMENTATION ONLY -----										
06	00	CENTRAL WAREWASH BR								
	01	CHIEF	05	06907	WS	C		1		
	02	MOTOR VEH OP	06	05703	WG	C		8		
	03	FOOD SVC WORK LDR (PPT)	02	07408	WL	C		3		
	04	FOOD SVC WORKER (PPT)	02	07408	WG	C		1		
	05	FOOD SVC WORKER (PPT)	01	07408	WG	C		19		
		TOTAL						32		

Incl 2 pp 6 to Annex D

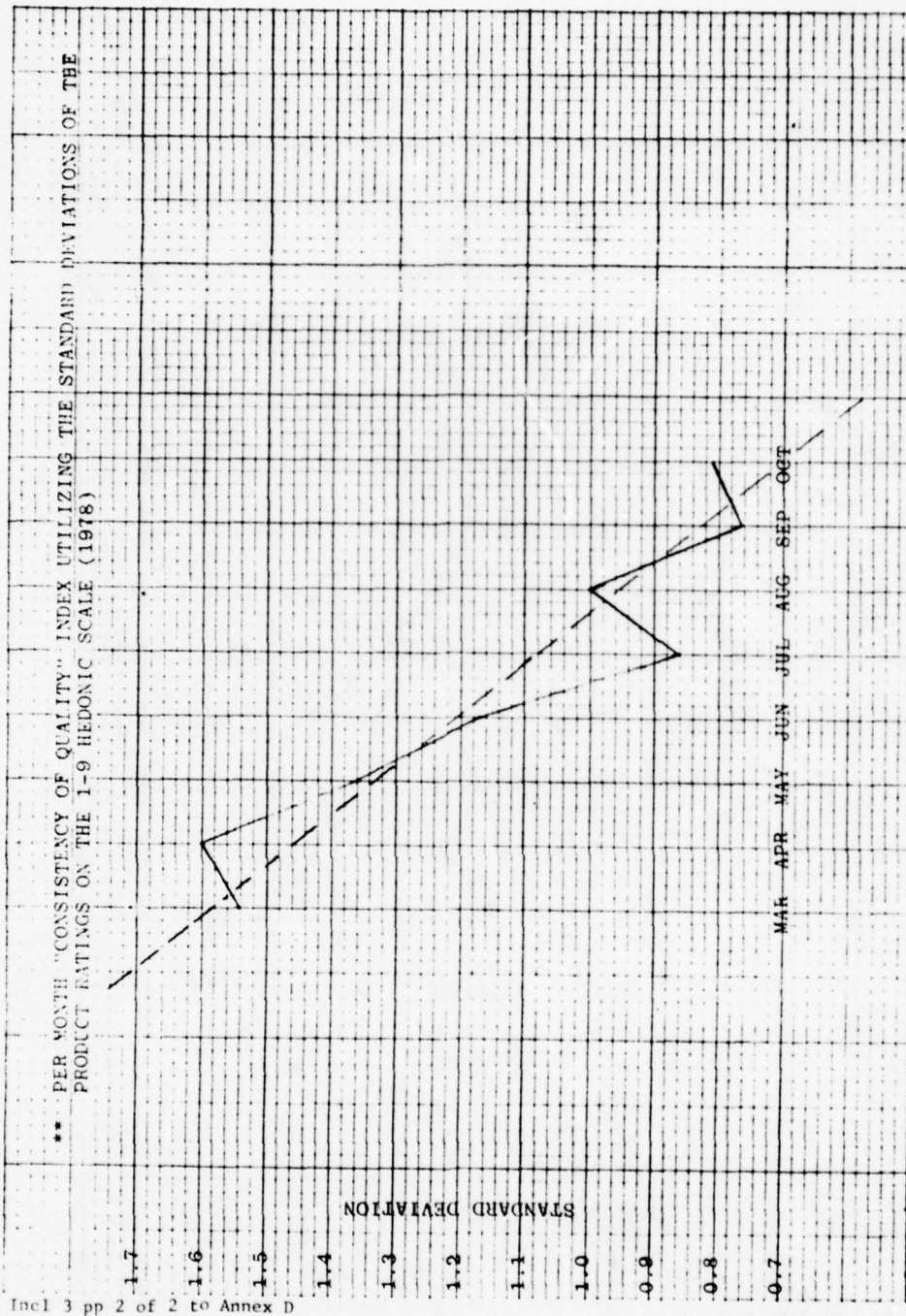
DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO
SECTION II - ORGANIZATION										DATE
DESIGNATION FT LEE DFM(P)										
LAST FOR COMPUTATION OF CHANGES 9000 MEALS W/CFPF										TDA <input checked="" type="checkbox"/> MTDA <input type="checkbox"/>
INDEX		DESCRIPTION	GRADE	MOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RMK
PAR	LINE									
#	E	C	D	E	F	G	H	I	J	K
		<u>TOTALS</u>								
		NOW CONFIGURATION:								
		OFFICER						5		
		WO						1		
		ENLISTED						55		
		FTP CIVILIANS						106		
		PPT CIVILIANS						86		
		TOTAL						253		
		LATER CONFIGURATION:								
		OFFICER						5		
		WO						1		
		ENLISTED						64		
		FTP CIVILIANS						117		
		PPT CIVILIANS						86		
		TOTAL						273		
		# WILL BE CHANGED AS SHOWN WHEN CFPF BECOMES FULLY OPERATIONAL								
		* NOT NEEDED UNTIL CENTRAL FOOD PREPARATION FACILITY BECOMES FULLY OPERATIONAL								
		XK INCLUDES 3 E7, 3 E6, 5 E5, 5 E4 and 2 E3 TOE MANYEARS								
		Incl 2 pp 7 to Annex D								

DETAILED TABLE OF DISTRIBUTION AND ALLOWANCES										TDA NO.	
SECTION II - ORGANIZATION										DATE	
DESIGNATION: FT LEE DFM(P)										TDA <input checked="" type="checkbox"/> MTD <input type="checkbox"/>	
BASE FOR COMPUTATION OF CHARGES: 9000 MEALS W/CPPF											
INDEX		DESCRIPTION	GRADE	MOS	BR	ID	ARMY MGT STRUCTURE CODE	REQ	AUTH	RMK	
PAR A	LINE B										
		<u>TOTALS</u>									
		BY ACTIVITY - <u>NOW</u>									
		OFFICE OF DIRECTOR						3			
		TECHNICAL SUPPORT OFC						3			
		SUPPORT DIV						39			
		DINING FAC OPNS DIV						189			
		CENTRAL FOOD PREP DIV						19			
		TOTAL						253			
		<u>LATER</u>									
		OFFICE OF DIRECTOR						3			
		TECHNICAL SUPPORT OFC						19			
		SUPPORT DIV						39			
		DIN FAC OPNS DIV						166			
		CENTRAL FOOD PREP DIV						46			
		TOTAL						273			
		Incl 2 pp 8 to Annex D									

** PER MONTH QUALITY INDEX RATING OF CENTRALLY PREPARED FOODS (1978)



MAR APR MAY JUN JUL AUG SEP OCT



Incl 3 pp 2 of 2 to Annex D

COOK STAFFING REQUIREMENTS

<u>Dining Facility</u>	<u>Minimum Cook Requirements Per Shift</u>		<u>Early Shift/Late Shift</u>	<u>Total Cook Personnel Required</u>	<u>Cook* Personnel Presently Assigned</u>	<u>Present** Cook Staffing Per Shift</u>		<u>Cook Shortfall</u>
P-9304	3	/	2	7	5	2/2	2/1	2
P-8400***	5	/	4	13	11	4	4	2
P-8402***	5	/	4	13	11	4	4	2
P-3701	4	/	3	10	9	4/3	3/3	1
P-3118	3	/	2	7	6	2	2(+)	1
P-3108	3	/	2	7	6	2	2(+)	1
P-3024	3	/	2	7	6	2	2(+)	1
TOTAL	26	/	19	64	54	20/19	20/18	10

*Includes cook personnel redistributed from T-2012 which closed 30 March 1978.

**P-9304: Part of the time the facility has 2/2 staffing and other times 2/1 staffing;
P-3701: Part of the time the facility has 4/3 staffing and other times 3/3 staffing;
P-3118, P-3108 and P-3024: These facilities average slightly more than 2/2, however, most of the time the staffing is only 2/2.

***Operates two separate serving lines.

COOK PERSONNEL

	<u>Number Recommended by TSA Food Mgt Asst Team</u>		<u>Number Recommended by TRADOC Manpower Survey</u>	
<u>Bldg</u>	<u>Per Shift</u>	<u>Total Staffing</u>	<u>Per Shift</u>	<u>Total Staffing</u>
P-9304	3/3	9.6	3/3	9.6
P-8402	11/11	35.2	8/8	25.6
P-8400	11/11	35.2	8/8	25.6
P-3701	6/5	17.6	5/5	16.0
P-3206	*		5/4*	14.4
P-3118	5/4	14.4	4/4	12.8
P-3108	5/4	14.4	5/4	14.4
P-3024	<u>4/3</u>	<u>11.2</u>	<u>4/4</u>	<u>12.8</u>
TOTAL	86	137.6	82	131.2

*Staffing augmented by Quartermaster School Instructors during CFPF evaluation. Present condition requires Directorate of Food Management to take over full operation of this facility.

NUMBER OF SERVINGS PRODUCED IN
CENTRAL FOOD PREPARATION FACILITIES
JANUARY - OCTOBER 1978

<u>MONTH</u>	<u>ENTREE</u>	<u>DESSERT</u>	<u>INGREDIENT PREPARATION</u>
Jan	57,386	122,734	219,567
Feb	152,469	150,761	217,305
Mar	198,213	58,425	211,352
Apr	69,155	51,528	189,554
May	66,271	161,045	201,325
Jun	56,599	185,110	160,183
Jul	90,061	71,251	184,965
Aug	143,000	113,917	167,442
Sep	117,785	132,634	216,343
Oct	<u>165,520</u>	<u>170,780</u>	<u>238,068</u>
TOTAL	1,116,459	1,218,185	2,006,104

GRAND TOTAL: 4,340,748 servings

CFPF EQUIPMENT LIST

The following list of equipment corresponds with engineering drawings of the Central Kitchen and Ingredient Scaling and Preparation Branches.

Central Kitchen

<u>Item Number</u>	<u>Nomenclature</u>
1	Scale
2	Skid Platform
3	Food Preparation Table
4	Sifting Machine
5	Dough Mixer
6	Mixing Machine
7	Ingredient Bin
8	Mixing Bowl, 21"
9	Mixing Bowl, 30"
10	Bowl Lifting and Pouring Truck
11	Pastry Rack
12	Reach-In Refrigerator
13	Hot Plate
14	Electric Mixing Machine
15	Cookie Cutting Machine
16	Cake Depositor, 18"
17	Icing Depositor
18	Sweet Roll Production Table
19	Dough Dividing and Rounding Machine
20	Dough Fermentation Room
21	Dough Proofing Box
22	Steam Jacketed Kettle
23	Dough Mixing Machine
24	Dough Divider
25	Pie Machine
26	Pie Filler Machine
27	Prefabricated Walk-In Refrigerator
28	Doughnut Machine
29	Doughnut Rack
30	Bag Sealer
30A	Bag Loader
30B	Packaging Conveyor
31	Revolving Tray Oven
32	Convection Oven
33	Pan Rack Washer
34	Drain Table
35	Pot, Pan and Utensil Washer
36	Feed Table
37	Pot Sink
38	Pot Washer

Central Kitchen - Continued

<u>Item Number</u>	<u>Nomenclature</u>
39	Garbage Disposal
40	Breading Machine
41	Automatic Fryer
42	One-Half Ton Cable Hoist Hook Mount
43	Fat Filter
44	Run Through Pressure Cooker
45	Frying Pan
46	Kettle System
47	Frozen Food Cabinet
48	Tank Cooker
49	Hoist Trolley
50	Hoist Trolley
52	Chilled Water Pump
53	Ice Builder
54	Compressor/Condenser Unit
55	Meat Slicer
56	Packaging and Portioning Conveyor
57	Food Pump and Transfer Assembly
59	Blast Tunnel Freezer
61	Filling Bench
62	Electric Marker
63	Walk-In Freezer
64	Cleaning and Sanitizing Unit
66	Can and Bottle Crusher
67	Metered Water (automatic)
70	Labeler
71	Fly Trap

Ingredient Preparation Facility

<u>Item Number</u>	<u>Nomenclature</u>
2	Scale, Dial and Beam Indicating
3	Food Washer
4	Lye Make-Up Tank
5	Lye Conveyor, Elevator Type
6	Ice Machine
8	Centrifuge, Crispin
11	Vertical Cutting Mixer
12	Vegetable Cutting and Slicing Machine
13	Vegetable Cutter and Slicer

Ingredient Preparation Facility - Continued

<u>Item Number</u>	<u>Nomenclature</u>
14	Vacuum Bagger
15	Meat Slicer
16	Meat Slicer
17	Molding Machine
18	Meat Mixer
19	Can and Bottle Opening and Depositing Center
20	Cryovac/Tipper Tie
NA	Food Waste Disposer
NA	Air Curtain
NA	Spray, Cleaning Unit
NA	Dollie Basket
NA	Electric Water Station
NA	Disposer, Food Waste
NA	Air Compressor
NA	Air Curtain
NA	Food Pump, Mobile
NA	Individual Portioning and Packaging Assembly
NA	Urschel Slicer/Dicer

NUMBER OF MEALS SERVED
IN FORT LEE DINING FACILITIES
JANUARY - OCTOBER 1978

January	185,074
February	183,465
March	183,750
April	169,622
May	183,691
June	167,434
July	160,184
August	191,428
September	216,027
October	<u>260,334</u>
TOTAL	1,901,009

ANNEX E

FOOD SERVICE WORKER, COMMANDER,

AND

CUSTOMER OPINION OF CENTRAL FOOD PREPARATION

BEHAVIORAL SCIENCES DIVISION

NARADCOM

Food Service Worker, Commander, and Customer Opinion of Central Food Preparation

The three major groups of individuals which would be impacted by an Army conversion to Central Food Preparation Facilities (CFPF) are military and civilian food service workers, unit commanders, and the food service customers. This report section discusses the opinions of the first two groups concerning central preparation in detail, and, to a lesser extent, considers customer opinion of central preparation. Another section of the report analyzes customer food acceptance during the Fort Lee test of CFPF.

Method

Ideally, a report of this type would compare opinions obtained before the implementation of CFPF (the pre-test) and opinions given a few months after implementation. In this instance, the research methodology involved work at two Army posts, Fort Lee and a MACOM post, Ft. Carson, chosen by USATSA. Two factors dictated a dual post methodology. First, since centrally prepared food (from the pilot kitchen) had already been distributed at Fort Lee, it was impossible to obtain opinions of CFPF prior to any exposure to the system. Such opinions are critical for the establishment of a motivation package for workers at other Army posts and for an uncontaminated pre-post test comparison of either workers or commanders. Secondly, Fort Lee is the only Army post operating with the Directorate of Food Management (DFM) concept. Negative (or positive) attitudes toward DFM are likely to confound the workers' or commanders'

evaluations of CFPF. The methodology, then, consisted of three phases, pre-CFPF evaluations at the two posts and a post-test evaluation at Fort Lee.

Pre-test, Fort Lee. The pre-test evaluation at Fort Lee took place in December 1977. It involved interviews and surveys of 48 military food service personnel and 41 civilian WL-8, WG-8 and WG-5 cooks at the nine DFM dining facilities (the facilities targeted to become satellites in the CFPF system). In addition, five civilian cooks and three military cooks were surveyed/interviewed at the central kitchen.

At each dining facility a written survey and the Job Description Index, a standard job satisfaction instrument with military food service workers norms and extensive civilian norms, were administered in a group situation to the entire morning/afternoon shifts. Individual workers were then engaged in face-to-face interviews to explore aspects of interest not amenable to inclusion in a written survey.

The survey and interview asked for opinions of workers concerning both DFM and their anticipations concerning the soon to be fully implemented CFPF system. A major effort was undertaken to attempt to isolate opinions concerning CFPF from either positive or negative biases toward DFM. The negative opinions toward CFPF will be the basis for recommendations concerning the development of a motivational package for CFPF implementation at other posts. It is important to emphasize that any problem perceived by the worker, whether it is a "real" problem or not, must

be addressed. In a very real sense, any problem that a worker anticipates is a genuine one for him. All opinions of CFPF will form the basis of part of the pre-post test comparison.

Ten company, battalion, and brigade commanders were also individually interviewed concerning their opinions of the DFM and CFPF concepts. The end product of the study of commander opinions will include both a concise summary of commander opinion of the CFPF system including recommendations for modification of the system, where feasible, to deal with commander satisfaction problems and a listing of these aspects of CFPF which should be addressed in any commander information package which may be developed.

All surveys and interviews used with both commanders and cooks are reproduced in the Appendix.

Pre-test, Fort Carson. The pre-test at Fort Carson was similar to that at Fort Lee, although unlike Fort Lee, extra care was exercised in providing a written, unbiased description of the DFM and CFPF concepts. For both food service workers and unit commanders, the same questionnaire, interview, and job satisfaction measurement techniques were used as at Fort Lee. At Fort Carson 109 military cooks were interviewed and 105 surveyed. There were no civilian cooks. The sample of cooks represented both battalion and brigade dining facilities. Thirteen company, battalion, and brigade commanders were interviewed.

In addition, surveys and interviews were conducted with prospective customers (E-2 through E-9) concerning their reaction to the CFPF concept.

A total of 103 BAS and SIK personnel were interviewed at both active (i.e., motor pool) and non-active (i.e., finance) worksites.

The customer interview and the changed portions of the customer and commander surveys and interviews are reproduced in the Appendix.

Post-test, Fort Lee. The post-test at Fort Lee contained most of the same survey and interview questions as the Fort Lee pre-test. The differences included the fact that opinions about CFPF were then a function of participation in the system rather than speculation. In addition, direct comparisons of their jobs - pre and post CFPF implementation - were elicited from the workers. An examination of workers' opinions concerning their training for CFPF was undertaken in the interview. The commander interview reflected similar changes. Customers were interviewed in a similar manner as at Fort Carson.

In the Fort Lee post-test, 37 military and 14 civilian satellite cooks, as well as two military and nine civilian central kitchen cooks, were interviewed and surveyed. Fourteen company, battalion, and brigade commanders were interviewed. In addition, 78 school students and 51 T.O. and E. customers (240th BN) were interviewed. An extra group of 33 Food Service NCOES students were also interviewed.

Again, changes in the survey and interview instruments are reproduced in the Appendix.

RESULTS

Food Service Worker Opinion of Central Food Management. One concern in the analysis of the Fort Lee data is the potential confounding of opinions concerning DFM (central food management) and CFPF. Table 1 shows the preferences of all cooks (both civilian and military at Fort Lee and military at Fort Carson) for either central or dispersed (company/battalion) management of dining facilities. It should be kept in mind that Fort Lee cooks were responding based on their experiences with DFM while Fort Carson cooks were responding to a description provided of central management. Three general statements can summarize the results from this table: 1) at each post, more cooks preferred CO/BN management; 2) the Fort Lee post-test sample of cooks, while still preferring CO/BN management, showed a shift toward central management; 3) the concept of central management was most popular at Fort Carson, a post where it does not exist.

Consideration of the data in Table 2 leads to a better understanding of the Fort Lee post-test increase in preference for central management. As can be seen, the military satellite cooks in the post-test sample showed a lower preference for DFM than the pre-test sample cooks (3% as compared to 8%). The civilian satellite cooks and the predominantly civilian central kitchen cooks show the increase in preference for DFM (17% to 36% and 25% to 64%, respectively). The higher post-test preference for central management shown in Table 1, then, is reflective of an opinion change in civilian cooks only.

The higher rating of central management by Fort Carson cooks can be explained by examination of Tables 3 and 4. The Fort Carson cooks, with

**Table 1. Percent Preference for Central or Dispersed (CO/BN)
Management: All Cooks**

	Fort Carson N = 109	Fort Lee Pre-Test N = 97	Fort Lee Post-Test N = 62
Prefer Central	43%	10%	21%
Neutral	6%	8%	11%
Prefer CO/BN	51%	82%	68%

Table 2. Percent Preference for Central or Dispersed (CO/BN) Management: Fort Lee Cooks

	Central Kitchen Cooks		Civilian Satellite Cooks		Military Satellite Cooks	
	Pre N=8*	Post N=11**	Pre N=41	Post N=14	Pre N=48	Post N=37
Prefer Central	25%	64%	17%	36%	8%	3%
Neutral	25%	27%	39%	14%	15%	6%
Prefer CO/BN	50%	9%	44%	50%	77%	91%

* 5 out of 8 civilian cooks

** 9 out of 11 civilian cooks

Table 3. Rank Ordered* Open Ended Responses Concerning What is Perceived as Good About Central Food Management: Military and Civilian Cooks

Fort Carson

1. There would be only one boss.
2. More uniformity
3. Manager would be a food professional

Fort Lee Pre-Test

1. DFM respects cooks
2. More uniformity
3. Can move cooks to cover other facilities

Fort Lee Post-Test

1. DFM are food professionals
2. Can move cooks to cover other facilities
3. DFM respects cooks

* Responses are listed in order (1) is the most frequent response, (2) the second most frequent, etc.

Table 4. Rank Ordered Open Ended Responses Concerning What is Perceived as Bad About Central Food Management: Military and Civilian Cooks

Fort Carson

1. Central management won't know each facilities' needs
2. No contact between cooks and central management
3. The manager is needed on site
4. Going to the field
5. Most NCO's would no longer be needed
6. Cooks won't know their customers

Fort Lee Pre-Test

1. Too many bosses
2. The unit commander has no influence over dining facility
3. DFM doesn't know each facilities' needs
4. The manager on site (food service sergeant) has no control
5. Going to the field
- 6.5. DFM doesn't care
- 6.5. Moving cooks to cover other facilities
8. Cooks don't know their customers

Fort Lee Post-Test

1. Too many bosses
2. The unit commander has no influence over dining facility
- 3.5. DFM doesn't care
- 3.5. Moving cooks to cover other facilities
5. Going to the field
6. Too few cooks
- 7.5. The manager on site (food service sergeant) has no control
- 7.5. Cooks don't know their customers
9. DFM doesn't know each facilities' needs

no actual exposure to central management, felt that the major advantage to such centralization would be that they would have only one boss. As can be seen in Table 4, the most frequently expressed complaint by both pre- and post-test Fort Lee cooks was that DFM, the Fort Lee version of central management, led to having too many bosses. To summarize, then, in all three samples of cooks surveyed, most of the cooks preferred local management rather than central. Most Fort Carson cooks preferring central management saw ^{it} in the advantage of eliminating multiple bosses, a perception which certainly did not occur and was actually reversed with Fort Lee's central management system.

Table 3 lists, in order from most frequent to least frequent, combined military and civilian cook responses from all three samples to an open ended question asking what was (or would be) good about central management. The Fort Carson sample's response concerning eliminating multiple bosses has already been discussed. Other perceived advantages of central management included satisfaction with the notion of managers who are food professionals, an acknowledgement of the desirability of central management prerogative of moving cooks from facility to facility to cover emergencies, and, at Fort Lee, a recognition that DFM treated cooks with respect. While the Fort Carson and Fort Lee pre-test samples predicted that central management might lead to more uniformity, the Fort Lee post-test sample failed to mention the existence of any such uniformity across the post.

Table 4 presents responses to a question concerning what was (or would be) bad about central management. Note that the two Fort Lee samples, those who have experiences DFM, say essentially the same things although, in some instances, in a slightly different order of frequency. As mentioned

above, both Fort Lee samples gave as their most frequent response, that there were too many bosses in the DFM system. There was a similar agreement concerning the second most frequent response. The cooks felt that the unit commander's not having influence over the dining facility was bad.

Other negative aspects of DFM reported by the Fort Lee cooks included objections to being moved from facility to facility, concerns that DFM didn't really care about them as individuals, the feeling that the food service sergeant at each facility was wasted—that he had no real control, the conviction that the cooks at each facility didn't know their customers' likes and dislikes in a system where different customers attend different meals and on different days, and the belief that DFM didn't know each individual dining facilities' unique needs. In addition, the Fort Lee cooks reported that going to the field was bad under the DFM concept. Some of these latter responses referred to the problems of a T, O, & E units' cooks being scattered across the post and then being brought together in the field. Under such conditions they report not knowing each other or their supervisor as well as they feel they should to optimally operate a field dining facility. In addition, the cooks who are left to operate the post facility claimed they are required to do so under extremely short handed conditions. When a company or battalion runs its own dining facility, the cooks usually work together both in garrison and the field; and when the unit goes to the field the dining facility closes.

The Fort Carson cooks listed many similar negative feelings about central management. In addition, they expressed concern about the lack

of contact between the individual cook and the central manager; and worried about the possibility that under central management many NCO's would no longer be required.

Unit Commander Opinion of Central Food Management. Unit commander (company, battalion, and brigade commanders) were queried concerning their feelings about DFM (both pre- and post-test at Fort Lee) and central management in general at Fort Carson as can be seen in Table 5, 75% or more of the commanders at Fort Lee preferred company/battalion management to DFM. Every commander interviewed at Fort Carson preferred local management.

Some Fort Lee commanders felt that DFM would remove at least one administrative concern from the commander of a unit. Some commanders in the Fort Lee pre-test sample and some in the Fort Carson sample felt that DFM might save money (see Table 6).

By far, however, as was indicated in Table 5, most commanders were negative in their opinions of central management. Table 7 lists the reasons given by the commanders for these negative feelings. Almost unanimously they were concerned about using influence over the dining facility. They felt that this loss of influence resulted (would result) in less responsiveness, poorer food, and generally lower unit morale. As a matter of fact, some Fort Lee post-test commanders specifically emphasized this latter point. The second most frequent negative aspect of central management cited by commanders in all three samples involved a perception of problems which occurred (might occur) in going to the field. The same concerns expressed by the cooks related to going to the field--the dispersion of a units' cooks to various dining facilities around the post while in garrison and the vacancies created in these post facilities when T, O, & E cooks are in the field--were expressed by

Table 5. Percent Preference for Central or Dispersed (CO/BN)
Management: Unit Commanders

	Fort. Carson N = 13	Fort Lee Pre-Test N = 10	Fort Lee Post-Test N = 14
Prefer Central	0%	25%	21%
Neutral	0%	0%	0%
Prefer CO/BN	100%	75%	79%

Table 6. Rank Ordered Open Ended Responses Concerning What is Perceived as Good About Central Food Management: Unit Commanders

Fort Carson

1. Money would be saved

Fort Lee Pre-Test

1. Takes one worry away from unit commanders
2. Money is saved

Fort Lee Post-Test

1. Takes one worry away from unit commander

Table 7. Rank Ordered Open Ended Responses Concerning What is Perceived as Bad About Central Food Management: Unit Commanders

Fort Carson

- 1.5 The unit commander would have no influence over dining facility
- 1.5 Going to the field
3. Most NCO's would no longer be needed

Fort Lee Pre-Test

1. The unit commander has no influence over dining facility
2. Going to the field

Fort Lee Post-Test

1. The unit commander has no influence over dining facility
2. Going to the field
3. Lack of unit integrity and morale

the unit commanders. Many T, O, & E commanders at Fort Lee pointed out the difficult position of a T, O, & E food service sergeant who is also a dining facility supervisor. When his unit goes to the field, he goes leaving behind a dining facility for which he is held responsible even in his absence. These concerns on the part of commanders about field operations probably help to explain why the Fort Carson unit commanders interviewed unanimously preferred managing their own facilities. They were all T, O, & E commanders with field responsibilities.

Summary of Food Service Worker and Unit Commander Opinion of Central Management. In general, the cooks and unit commanders were negative about DFM (Fort Lee Samples) or negative about the idea of central management (Fort Carson samples). The group of cooks at Fort Carson who speculated that they might like central management felt that it would help reduce their multiplicity of bosses. At Fort Lee the cooks report DFM doing just the opposite. The main positive aspects of DFM perceived by the cooks involved the professionalism of DFM (central management) personnel and the central manager's ability to move cooks around to fill vacancies. The major advantages perceived by unit commanders involved saving money and removing one responsibility from the commander. There were many negative food service worker perceptions of DFM/central management. The most frequently expressed ones included too many bosses, the unit commander having no influence, the on-site manager (food service sergeant) having no control, and going to the field. Unit commanders did not like the notion of losing control over the dining facility and were also concerned about problems related to going to the field.

Food Service Worker Opinion of Central Food Preparation. Several questions addressed to the cooks concerned central food preparation. It should be kept in mind that Fort Carson personnel answering these questions were responding to a description provided of central preparation. Fort Lee pre-test personnel were speculating about the soon-to-be-implemented CFPF, but were also influenced (as will be seen) by their exposure to test products which had been distributed in the months prior to our pre-test by the CFPF pilot kitchen. The Fort Lee post-test personnel had been working in the CFPF system.

Table 8 shows the preferences of all cooks for either central (CFPF) or local (at each dining facility) preparation. As can be seen, approximately 2/3 of each sample preferred local preparation to central. Also note that at Fort Lee there was a slight shift in preference with a few percentage points moving from the "neutral" to the "prefer local preparation" category.

The opinion data from the Fort Lee cooks is further partitioned in Table 9. Note that the slight post-test shift toward preference for local preparation in Table 8 was a function of military satellite cook opinion. The post-test civilian satellite cooks and predominantly civilian central kitchen cooks both shifted somewhat toward a preference for CFPF.

Table 10 displays the cooks responses to an open ended interview question asking what was (would be) good about CFPF. The responses of each sample are rank ordered based on the frequency with which they were given. Note that both the Fort Carson and Fort Lee pre-test samples speculating about central preparation felt that their work might be easier (as a matter of fact, this was by far the most frequent response).

Table 8. Percent Preference for Central (CFPF) or Local Preparation: All Cooks

	Fort Carson N=109	Fort Lee Pre-Test N=97	Fort Lee Post-Test N=62
Prefer CFPF	31%	28%	27%
Neutral	5%	7%	2%
Prefer Local Preparation	64%	65%	71%

Table 9. Percent Preference for Central (CFPF) or Local Preparation: Fort Lee Cooks

	Central Kitchen Cooks		Civilian Satellite Cooks		Military Satellite Cooks	
	Pre N=8*	Post N=11**	Pre N=41	Post N=14	Pre N=48	Post N=37
Prefer CFPF	37.5%	64%	29%	36%	25%	14%
Neutral	25%	9%	0%	0%	10%	0%
Prefer Local Pre- paration	37.5%	27%	71%	64%	65%	86%

* 5 out of 8 civilian cooks

** 9 out of 11 civilian cooks

Table 10. Rank Ordered Open Ended Responses Concerning What is Perceived as Good About Central Food Preparation: Military and Civilian Cooks

Fort Carson

1. The work would be easier
2. Time would be saved
3. There would be a savings in personnel
4. Food quality would be better

Fort Lee Pre-Test

1. The work would be easier
2. Food quality would be better
4. Time would be saved
4. There would be a savings in personnel
4. Ingredient preparation

Fort Lee Post-Test

1. Time is saved
2. There is a savings in personnel
3. Food quality is better
4. The work is easier
5. Ingredient preparation

Substantially fewer Fort Lee post-test cooks reported that their work was actually easier. Other frequent responses concerned savings in time and personnel. Some cooks felt that food quality of some items would increase. The Fort Lee cooks also expressed appreciation of the ingredient preparation aspect of CFPF. Receiving salad ingredients and vegetables ready for cooking is an advantage for the cooks.

As might be expected from the sizable percentage of cooks who did not prefer central preparation (CFPF), there were numerous responses to the open ended interview question concerning what was (would be) bad about central preparation (Table 11). The most frequent response by far expressed the feeling that food quality would be (was) worse with central preparation. The Fort Carson sample's response was based mostly on apparent negative impression of the frozen food concept. The Fort Lee pre-test sample was strongly influenced by their exposure to the pilot kitchen test items, many of which were of poor quality. The sixth ranking response of food quality represents those Fort Lee pre-test cooks who, like the Fort Carson cooks, had negative perceptions of frozen foods. The Fort Lee post-test sample had been exposed to the CFPF operation, and their response reflects some combination of this exposure and their biases concerning the central preparation concept. The reality of food acceptance is dealt with in another section of this report; the fear of lower acceptability was realized.

A second major concern expressed by all three samples concerns what they feel was (would be) a lack of training on the job. They felt that heating frozen items would not advance their skills as an Army cook, nor would it help prepare them for meaningful employment outside the Army.

Table 11. Rank Ordered Open Ended Responses Concerning What is Perceived as Bad About Central Food Preparation: Military and Civilian Cooks

Fort Carson

1. Food quality would be worse
2. Lack of training on the job (OJT)
3. Would prefer to cook, not just reheat items
4. Customer complaints about CFPF food
5. Going to the field
6. Cook morale would be bad
7. Run outs

Fort Lee Pre-Test

1. Food quality would be worse (pilot kitchen)
2. Would prefer to cook, not just reheat items
3. Lack of training on the job (OJT)
4. Going to the field
5. Customer complaints about CFPF food
6. Food quality would be worse
7. There would be more food waste

Fort Lee Post-Test

1. Food quality is worse
2. Lack of training on the job (OJT)
3. Food is often overcooked
- 4.5. Would prefer to cook, not just reheat items
- 4.5. Customer complaints about CFPF food.
6. Waste of disposable food containers
7. Too few cooks
8. Too much handling of food
- 9.5. Satellite cooks never rotate to the central kitchen
- 9.5. CFPF runs out of items

Several cooks also specifically stressed the point that they were cooks and wanted to prepare items from "scratch", not merely reheat frozen products.

Cooks in all three samples expressed concern about customers complaining to them about food which they didn't prepare. They maintained that they would not mind being criticized for their own mistakes, but did not want to be held responsible for the errors of the central kitchen cooks.

Fort Carson and Fort Lee pre-test cooks were also concerned about whether after just warming up frozen food they would be prepared to cook from "scratch" in the field. The post-test Fort Lee cooks did not seem to be concerned about this.

A few negative comments by the Fort Lee post-test cooks who were the only group to actually experience CFPF should be mentioned. It should also be mentioned that these comments, as well as some of the preceding, reflect on CFPF as implemented at Fort Lee. Several of these cooks indicated that food items tended to be overcooked; implying that there was no way to reheat some items without overcooking them. Some cooks also pointed out the expense incurred through the large number of disposable food containers thrown out daily. There were also complaints that there were too few cooks to adequately staff the satellite facilities, that there was too much handling of food items, that satellite cooks were not rotated through the central kitchen as had been promised, and that the CFPF sometimes ran out of items. The finding of lower food acceptance is not entirely surprising given many of these perceptions.

Unit Commander Opinion of Central Food Preparation. Similar questions to those asked of the cooks concerning food preparation were also addressed to unit commanders at Fort Carson and Fort Lee. Table 12 displays commanders' preferences for central preparation (CFPF) or local preparation. The Fort Carson commanders were nearly unanimous in their preference for local preparation. Many of the Fort Lee pre-test commanders interviewed adopted a "wait and see" neutral attitude toward CFPF; but, as can be seen, shifted in the post-test to a preference for local preparation. This 72% preferring local preparation is virtually identical to the 71% of Fort Lee post-test cooks who also preferred local preparation (Table 8).

Many of the responses given by the commanders in response to the open ended interview question concerning what was (would be) good about central preparation (CFPF) approximated those given by the cooks. The most frequent response given concerned savings in money. Some Fort Lee commanders also felt that savings in personnel would (did) result from the CFPF system. Some Fort Lee post-test commanders perceived that some CFPF food items were of better quality and some recognized the usefulness of the ingredient preparation aspect of CFPF. (Table 13)

The commanders' negative perceptions of central preparation (CFPF) also reflected many of the primary concerns of the cooks. As with the cooks, far and away the most frequently expressed concern about CFPF concerned inferior food quality. Many commanders also worried about the lack of training in cooking skills for satellite cooks and expressed doubts that cooks who reheated frozen foods in garrison could cook from "scratch" in the field. (Table 14)

Table 12. Percent Preference for Central (CFPF) or Local Preparation: Unit Commanders

	Fort Carson N = 13	Fort Lee Pre-Test N = 10	Fort Lee Post-Test N = 14
Prefer CFPF	8%	25%	14%
Neutral	0%	42%	14%
Prefer Local Preparation	92%	33%	72%

Table 13. Rank Ordered Open Ended Responses Concerning What is Perceived as Good About Central Food Preparation: Unit Commanders

Fort Carson

1. Money would be saved

Fort Lee Pre-Test

- 1.5. Money would be saved
- 1.5. There would be a savings in personnel

Fort Lee Post-Test

1. Money is saved
2. Food quality is better
- 3.5. Ingredient preparation
- 3.5. There is a savings in personnel

Table 14. Rank Ordered Open Ended Responses Concerning What is Perceived as Bad About Central Food Preparation:
Unit Commanders

Fort Carson

1. Food quality would be worse
2. Going to the field
3. Cook morale would be bad
4. Lack of training on the job (OJT)

Fort Lee Pre-Test

1. Food quality would be worse
2. Lack of training on the job (OJT)
3. Going to the field

Fort Lee Post-Test

1. Food quality is worse
2. Lack of training on the job (OJT)
3. Going to the field

Summary of Food Service Worker and Unit Commander Opinion of Central Food Preparation. Both cooks and unit commanders strongly preferred local preparation to central food preparation. The main advantages seen in central preparation by both groups included savings in money, time, and personnel. Fort Lee cooks and commanders also recognized the utility of the ingredient preparation function. The main disadvantages of CFPF seen by both cooks and commanders included poorer food quality, lack of training for cooks on the job, and going to the field. Cooks were also concerned with reheating items instead of cooking from "scratch" and customer complaints about food that the central kitchen and not they had prepared. The Fort Lee post-test cooks who were the only group to actually work in the CFPF system also reported that some food items were overcooked, that there was waste incorporated in the disposing of food containers after a single use, that there were too few cooks, that there was too much handling of food items, that satellite cooks were not rotated through the central kitchen, and that the CFPF ran out of some items.

Customer Opinion of Central Food Preparation. At Fort Carson and in the Fort Lee post-test customers were asked to respond with a preference for central or local food preparation. As shown in Table 15, approximately 2/3 to 3/4 of the customers interviewed at both posts preferred local preparation. The same question addressed to a group of Fort Lee Food Service NCOES students produced a similar response. The Fort Carson customers appeared to be responding based mostly on their biases about frozen food and Army food, while the Fort Lee customers were probably responding based on both such biases and actual exposure to CFPF food items.

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Table 15. Percent Preference for Central (CFPF) or Local Preparation: Customers.

	<u>Fort Carson N = 103</u>	<u>Fort Lee Post-Test N = 129</u>	<u>Fort Lee NCOES Class N = 33</u>
Prefer CFPF	25%	9%	33%
Neutral	13%	14%	3%
Prefer Local Preparation	62%	77%	64%

The customers were asked to list what they perceived to be positive aspects of central preparation (see Table 16). Both samples of customers felt that the quality of some items would be (was) better, that things would be (were) easier for the cooks, and that savings in personnel would (did) result. Some of the Fort Carson customers also reported that their present cooks were bad and that perhaps only the better cooks would be retained for a central kitchen. The Fort Lee customers also reported a savings in personnel.

The customers reports of negative aspects of central preparation (CFPF) are rank ordered in Table 17. Both samples' main concern centered around poorer quality food. The Fort Carson sample's response reflects solely the anticipation of the inferior quality on centrally prepared, frozen food. The Fort Lee sample's response in some instances reflects the actual experience of inferior food products and, in others, a general bias against centrally prepared, frozen food. Both samples talk about decreasing variety in a central preparation system and some customers express satisfaction with their present dining facility cooks indicating that they prefer these present cooks to a group of unknown central kitchen cooks.

The Fort Lee post-test customers also expressed some other concerns. They agree with the cooks (Table 11) in reporting some central food items as being overcooked. Some also feel that frozen food loses some of its nutritional value. Some also reported food as being served too cold and others expressed concern with potential transportation problems (from central storage to the satellites) during bad weather.

Table 16. Rank Ordered Open Ended Responses Concerning What is Perceived as Good About Central Food Preparation: Customers

Fort Carson

1. Money would be saved
2. Our present cooks are bad; good cooks would be retained
3. Food quality would be better
4. It would be easier for the cooks

Fort Lee Post-Test School Students and 240th BN

1. Food quality is better
2. Money is saved
3. It is easier for the cooks
4. There is a savings in personnel

Table 17. Rank Ordered Open Ended Responses Concerning What is Perceived as Bad About Central Food Preparation: Customers

Fort Carson

1. Food quality would be worse
2. There would be less variety
3. Like our present cooks preparing the food

Fort Lee Post-Test School Students and 240th BN

1. Food quality is worse
2. Cooks would prefer to cook, not just reheat items
3. Food is often overcooked
4. Food loses nutrition when frozen
5. There is less variety
7. Food is too cold
7. Over cooks are good, they should prepare the food
7. Transportation problems in bad weather

Food Service Worker Ratings of Various Aspects of Their Food

Service Operation. The written survey administered to the cooks asked the Fort Lee pre- and post-test sample to rate 14 factors in their food service operation. The Fort Carson cooks rated 11 factors, eliminating the three which dealt with civilian cooks and DFM. Table 18 presents the rank ordered mean responses of military, civilian, and central kitchen cooks from all three surveys. The table is fairly complex and contains a great deal of information. The most interesting and essential points to be made from these data follow. 1) The highest ratings of factors by any group were given by the post-test central kitchen cooks. 2) The very low ratings given interest and support of DFM support the negative responses concerning DFM reported earlier. 3) In both the pre- and post-tests, the Fort Lee civilian cooks were, in general, more positive about the food service operation than their military counterparts. This difference was greater in the post-test. 4) Data reported earlier clearly indicated dissatisfaction with CFPF. Several pre-post differences in this table are in the same direction. The menu, customers satisfaction, and the on-the-job training (OJT) program were all rated lower by both military and civilian cooks under CFPF (in the post-test) than in the pre-test. 5) Two related aspects of the food service operation, the proper maintenance of equipment and the condition (repair) of equipment, were both rated more positively by the post-test sample.

Fort Lee Food Service Worker Evaluation of CFPF Training. Data have already been reported which indicate some concerns about training. Cooks and commanders were both concerned about the lack of training on the job under CFPF and some Fort Lee satellite cooks expressed some concern about not being rotated through the central kitchen. In addition, the Fort Lee post-test sample of cooks was interviewed concerning their training for working in the CFPF system.

When the satellite cooks, both military and civilian, were asked if they had specific training for CFPF, 40% responded affirmatively and 60% negatively. Of the cooks who reported being trained, 50% said that the training medium was a manual or booklet. It may be that the cooks who said they weren't trained also used these manuals but did not view them as training. One dining facility's personnel reported a thorough indoctrination conducted by their food service sergeant. Some food service sergeants reported tours and lectures concerning CFPF.

Many of the cooks complained about the quality of the manuals, maintaining that, in many instances, they are incorrect.

When asked if they should have had more training, most of the cooks (80%) responded negatively implying in their answers that if you could read you could follow the direction for reheating. Again, several cooks (approximately 35%) complained about the lack of accuracy in some of the instructions.

Only three of the central kitchen cooks interviewed (27%) said that they had been trained. Again, however, most (82%) said that training was not necessary.

Despite the cooks' feelings that CFPF doesn't tax their skills

sufficiently to warrant training, the overwhelming negative attitude of the cooks toward CFPF certainly indicates that some kind of motivational training package should be initiated if the decision is made to implement CFPF elsewhere in the Army. Similar motivational packages should be designed for unit commanders and customers.

SUMMARY RECOMMENDATIONS

1. A concerted effort be made to improve food quality of centrally prepared items.
2. A concerted effort be made to develop formal, hands-on training programs in cooking skills for implementation at satellite facilities. Such training would help preclude some of the cook and commander objections to CFPF.
3. To eliminate some of the concerns about field feeding, a formal, hands-on training program in field food service should be initiated for all cooks.
4. Satellite cooks should be rotated through the central kitchen.
5. Consideration should be given to increased unit commander control over the satellite facilities and to a realignment of military cooks where, as much as possible, they work in garrison with their own unit personnel.
6. If CFPF is to be implemented elsewhere in the Army, motivational training packages should be developed for cooks, commanders, and customers.

Table 18. Rank Ordered* Mean Ratings** of Present Status of Factors in the Food Service Operation: Cooks

Factor	Military Cooks		Fort Carson	Civilian Cooks		Central Cooks
	Fort Lee Post-Test	Fort Lee Pre-Test		Fort Lee Post-Test	Fort Lee Pre-Test	Fort Lee Post-Test
Cooperation among Army cooks	(1) 5.25	(5) 4.86	(7.5) 4.98	(7) 5.62	(12) 4.59	(5) 6.44
Leadership from food service sergeant	(2) 5.08	(1) 5.51	(2) 5.61	(1) 6.46	(2) 5.54	(2.5) 6.56
Leadership from shift leader	(3) 4.89	(4) 5.02	(4) 5.54	(3.5) 6.08	(3) 5.53	(9) 5.67
Civilian food workers (K's)	(4) 4.86	(6) 4.77	(3) 5.58	(3.5) 6.08	(9) 4.77	(7.5) 6.33
Cooperation among Army and civilian cooks	(5) 4.81	(7) 4.74	—	(5) 5.92	(5) 5.16	(5) 6.44
Proper equipment maintenance	(6) 4.53	(12) 3.98	(7.5) 4.98	(9) 5.08	(13) 4.37	(10) 5.56
Condition (repair) of equipment	(7.5) 4.50	(13) 3.74	(11) 4.76	(11) 4.54	(14) 4.20	(7.5) 6.33
The menu	(7.5) 4.50	(2) 5.16	(6) 5.03	(13) 4.08	(4) 5.51	(12) 4.78
Sanitary condition	(9) 4.17	(11) 4.23	(1) 5.98	(6) 5.85	(7) 4.94	(2.5) 6.56
Customer satisfaction	(10) 4.03	(9) 4.64	(9) 4.88	(10) 4.62	(6) 5.00	(14) 4.33
Food preparation skills of civilian cooks	(11) 4.00	(3) 5.06	—	(2) 6.31	(1) 5.97	(5) 6.44
Food preparation skills of Army cooks	(12) 3.92	(8) 4.72	(5) 5.17	(8) 5.31	(10) 4.68	(1) 6.67
The OJT program	(13) 3.33	(10) 4.50	(10) 4.83	(14) 3.77	(8) 4.84	(11) 5.22
Interest & support of DFM	(14) 2.58	(14) 3.25	—	(12) 4.23	(11) 4.62	(13) 4.67

* Number in parenthesis expresses the rank order of a given factor within a given response sample.

** Scale: 7 - Very good; 6 - Moderately good; 5 - Slightly good; 4 - Neither bad nor good; 3 - Slightly bad; 2 - Moderately bad; 1 - Very bad.

THE SERVICE WOMEN SURVEY

The Service Women Survey was conducted by the Army Research Office-Durham (AROD) in 1971. This is a longitudinal study of the lives of service women in the United States. The study is designed to provide information on the experiences of service women in the military and on the impact of military service on their lives. The study is a longitudinal study, meaning that it follows the same group of people over time. The study is a national study, meaning that it includes people from all over the United States. The study is a quantitative study, meaning that it uses numbers to measure things. The study is a descriptive study, meaning that it describes what is going on. The study is a correlational study, meaning that it looks for relationships between things. The study is a causal study, meaning that it looks for causes and effects. The study is a longitudinal study, meaning that it follows the same group of people over time. The study is a national study, meaning that it includes people from all over the United States. The study is a quantitative study, meaning that it uses numbers to measure things. The study is a descriptive study, meaning that it describes what is going on. The study is a correlational study, meaning that it looks for relationships between things. The study is a causal study, meaning that it looks for causes and effects.

You will notice that we have not asked for your name or social security number. Therefore, the answers you give us are confidential.

A. In this study, you are asked to answer most of the questions in this survey. You may skip any question that you do not want to answer. If you skip a question, it will not be counted in the results of the survey. You may also skip a question if you do not know the answer. If you skip a question, it will not be counted in the results of the survey.

Example 1: The question below asks for a telephone number. If you write "0" in the blank, you will not be asked for a telephone number. If you write "1" in the blank, you will be asked for a telephone number.

Example 2: The question below asks for a telephone number. If you write "0" in the blank, you will not be asked for a telephone number. If you write "1" in the blank, you will be asked for a telephone number.

Example 3: This question asks you to write down the name of the person who is your closest friend. If you write down the name of a person who is not your closest friend, you will not be asked for the name of your closest friend. If you write down the name of a person who is your closest friend, you will be asked for the name of your closest friend.

APPENDIX

Variable	Mean	Standard Deviation	Minimum	Maximum
1. Age	21.5	2.5	18	25
2. Education	12.5	1.5	10	15
3. Income	15.5	3.5	10	25
4. Service	1.5	1.0	0	2
5. Satisfaction	3.5	1.5	1	5
6. Health	4.5	1.0	3	5
7. Family	2.5	1.0	1	3
8. Friends	3.5	1.0	2	4
9. Career	2.5	1.0	1	3
10. Life	3.5	1.0	2	4

PRE-TEST FOOD SERVICE WORKER SURVEY

CFFP WORKER INTERVIEW

The Natick R & D Command has been asked by the Army to study the tests of Central Food Preparation Facilities. This is your opportunity to have a say in this study. In the past we have implemented recommendations made by customers and workers in studies for the Navy (NAS Alameda), Air Force (Travis AFB), and Army (Fort Lewis). Please take this survey seriously; we take your opinions seriously, so please read every questions carefully, and give your honest answers.

You will notice that we have not asked for your name or social security number. Therefore, the answers you give us are confidential.

It is fairly clear how to answer most of the questions in this survey; you simply write in the correct numbers or circle the appropriate letters or numbers. Below there are examples of the 3 most common types of questions with some answers written in so you can see how to do it.

Example 1. The question below asks for a write-in answer. If you were 5 ft. 8 in. tall, you would write these numbers in as we have done.

Indicate your height. 5 feet 8 inches

Example 2. This question asks how satisfied you are with certain aspects of the Army. If you were slightly satisfied with your supervisor, you would circle 5 next to supervisor. If you were very dissatisfied with your uniform, you would circle 1 next to uniform. If you were satisfied with your pay, you would circle 6 next to pay. Your questionnaire would look like this.

Tell us how satisfied or dissatisfied you are with these aspects of the Army. (Circle one number for each aspect)

	Very Satisfied	Satisfied	Slightly Satisfied	Neither Satisfied Nor Dissatisfied	Slightly Dis- satisfied	Dis- satisfied	Very Dis- satisfied
a. Supervisor	7	6	5	4	3	2	1
b. Uniform	7	6	5	4	3	2	1
c. Pay	7	6	5	4	3	2	1

Example 3. For this example, we've taken the same question as the second example and set it up a little differently. You still circle the number which best describes your feelings. Again, if you were slightly satisfied with your supervisor you would circle 5 next to supervisor. If you were very dissatisfied with your uniform, you would circle 1 next to uniform. If you were satisfied with you pay, you would circle 6 next to pay. Your questionnaire would look like this.

7	6	5	4	3	2	1
Very Satisfied	Satisfied	Slightly Satisfied	Neither Satisfied Nor Dis-satisfied	Slightly Dis-satisfied	Dis-satisfied	Very Dis-satisfied

Please tell us how you feel about each of the following aspects of Army life by circling the appropriate number for each factor.

- a. Supervisor 7 6 5 4 3 2 1
- b. Uniform 7 6 5 4 3 2 1
- c. Pay 7 6 5 4 3 2 1

Example 1. For this example, we will take the same question as the example
 example and see if we can find a little difference. You will think the answer
 which best describes your feelings. Again, if you were slightly satisfied
 with your supervisor, you would circle 3 next to satisfied. If you were
 very dissatisfied, you would circle 5 next to dissatisfied. You would circle 1 next to satisfied.
 If you were dissatisfied with your supervisor, you would circle 5 next to dissatisfied. You
 would circle 1 next to satisfied.

Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
5	4	3	2	1

Please fill in the following table with the following information of your
 job. Write the appropriate number for each item.

PRE-TEST FOOD SERVICE WORKER SURVEY

1. Please write in the number of your present grade. E- _____
2. Please write in your primary MOS. _____
3. How would you describe your present job in food service? (Please circle one number)

1. FD SVC SGT
2. First Cook
3. Senior Cook
4. Cook
5. Cooks Apprentice
6. Clerk
7. Other (please specify) _____

4. To how many bases (besides this one) have you been assigned/attached in food service?

_____ bases

5. Do you plan to REENLIST when your present enlistment ends? (Circle the appropriate number)

- 0 No, I am retiring
- 1 Definitely yes
- 2 Probably yes
- 3 Undecided
- 4 Probably no
- 5 Definitely no

6. What are your FEELINGS ABOUT THE MILITARY SERVICE? (Circle the appropriate number.)

Dislike	Dislike	Dislike		Like	Like	Like
Very Much	Moderately	a Little	Neutral	a Little	Moderately	Very Much
1	2	3	4	5	6	7

1.. Please circle the number next to your present job and grade.

1. Cook Leader WL
2. Cook WG8
3. Cook WG5
4. Baker Leader WL
5. Baker WG8
6. Baker Helper WG5

2. What are your feelings about working for the military service? (Circle the appropriate number)

Dislike	Dislike	Dislike		Like	Like	Like
Very Much	Moderately	a Little	Neutral	a Little	Moderately	Very Much
1	2	3	4	5	6	7

3 - 6 For military personnel only.

We would like you to rate each factor below on HOW GOOD OR BAD each actually is in terms of the PRESENT FOOD SERVICE OPERATION in your dining facility. Please use the following scale.

Very Bad	Moderately Bad	Slightly Bad	Neither Bad Nor Good	Slightly Good	Moderately Good	Very Good
1	2	3	4	5	6	7

Please circle a number for each factor keeping in mind you are now rating how good or bad each factor is in your dining facility.

a. The condition (repair) of equipment and utensils	1	2	3	4	5	6	7
b. Sanitary conditions in the kitchen and dining area	1	2	3	4	5	6	7
c. The food preparation skills of <u>Army</u> cooks	1	2	3	4	5	6	7
d. The food preparation skill of <u>civilian</u> cooks	1	2	3	4	5	6	7
e. Leadership from your food service SGT	1	2	3	4	5	6	7
f. Leadership from your shift leader	1	2	3	4	5	6	7
g. Support and cooperation among Army cooks	1	2	3	4	5	6	7
h. Support and cooperation among Army and civilian cooks	1	2	3	4	5	6	7
i. Civilian food service workers (KP's)	1	2	3	4	5	6	7
j. Interest and support of Division Food Management (DFM)	1	2	3	4	5	6	7
k. Customer satisfaction	1	2	3	4	5	6	7
l. The On-The-Job training (OJT) program	1	2	3	4	5	6	7
m. Proper maintenance of equipment	1	2	3	4	5	6	7
n. The menu	1	2	3	4	5	6	7

8. Of the factors rated in question 7 above, please tell us which are the three WORST in terms of their present status in your dining facility.

The worst factor is factor _____
 The second worst factor is factor _____
 The third worst factor is factor _____

9. How would you describe YOUR dining facility? For each category indicate your opinion of the facility by circling a number.

	Very Bad	Moder- ately Bad	Slight- ly Bad	Neutral	Slightly Good	Moder- ately Good	Very Good
a. General dining facility environ- ment	1	2	3	4	5	6	7
b. Quantity of food	1	2	3	4	5	6	7
c. Variety of food	1	2	3	4	5	6	7
d. Quality of main dishes	1	2	3	4	5	6	7
e. Quality of starches	1	2	3	4	5	6	7
f. Quality of vegetables	1	2	3	4	5	6	7
g. Quality of salads	1	2	3	4	5	6	7
h. Quality of desserts	1	2	3	4	5	6	7

10. How would you rate this dining facility in comparison to others in which you have worked? (Circle one number)

This facility is:

This is my First Facil- ity	Much Worse	Somewhat Worse	Slightly Worse	No Better or Worse	Slightly Better	Somewhat Better	Much Better
0	1	2	3	4	5	6	7

In this next series of questions (11-14), we are interested in your honest feeling about your work in Army Food Service. Please read each item carefully and select the one alternative that BEST describes your current feelings.

11. On most days on your job, how often does time seem to drag for you?

1. About half the day or more
2. About 1/3 of the day
3. About 1/4 of the day
4. About 1/8 of the day
5. Time never seems to drag

12. Some people are completely involved in their job - they are absorbed in it day and night. For other people, their jobs are simply one of several interests. How involved do you feel in your job?

1. Very little involved; my other interests are more absorbing
2. Slightly involved
3. Moderately involved; my job and my other interests are equally absorbing
4. Strongly involved
5. Very strongly involved; my work is the most absorbing influence to my life

13. How often do you do some extra work for your job which isn't really required of you?

5. Almost every day
4. Several times a week
3. About once a week
2. Once every few weeks
1. About once a month or less

14. Would you say you work harder, less hard, or about the same as other people doing your type of work on this ship?

5. Much harder than most others
4. A little harder than most others
3. About the same as most others
2. A little less hard than most others
1. Much less hard than most others

15. Which of the following BEST describes the people eating in this facility?
(Circle one number)

- 1 They often complain about the food
- 2 They sometimes complain about the food
- 3 They say nothing about the food
- 4 They sometimes say they like the food and
sometimes complain about the food
- 5 They sometimes say they like the food
- 6 They often say they like the food

16. In your opinion how much future is there in the Army food service career field? (Please circle one number.)

- | | | | | | | |
|------|----------------|--------|------|--------------|------|--------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| None | Very
Little | Little | Some | Considerable | Much | Very
Much |

17. How useful do you feel your Army food service training and experience would be to you in a civilian food service job? (Circle the appropriate number.)

- 7 Extremely useful
- 6 Very useful
- 5 Considerably useful
- 4 Somewhat useful
- 3 Of little use
- 2 Of very little use
- 1 Of no use

18. How well or poorly does your present job match your training and experience?
(Circle the appropriate number.)

- | | | | | | | |
|----------------|----------------------|--------------------|---------|------------------|--------------------|--------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Very
Poorly | Moderately
Poorly | Slightly
Poorly | Neutral | Slightly
Well | Moderately
Well | Very
Well |

19. Which system would you prefer for the management of Army dining facilities, company/battalion level management or division food management?
(Circle one number)

- 1 Division food management much better
- 2 Division food management somewhat better
- 3 Division food management slightly better
- 4 About the same
- 5 Company/battalion management slightly better
- 6 Company/battalion management somewhat better
- 7 Company/battalion management much better

20. Based on what you might have heard about the central food preparation facility, would you prefer it or the present system where food is completely prepared at each dining facility?

- 1 Preparation at each facility much better
- 2 Preparation at each facility somewhat better
- 3 Preparation at each facility slightly better
- 4 About the same
- 5 Central preparation slightly better
- 6 Central preparation somewhat better
- 7 Central preparation much better

21. Using the scale below, please tell us how you feel about each of the following aspects of your job by circling the appropriate number for each factor.

7	6	5	4	3	2	1
Very Satisfied	Somewhat Satisfied	Slightly Satisfied	Neither Satisfied Nor Dissatisfied	Slightly Dissatisfied	Somewhat Dissatisfied	Very Dissatisfied

a. The chance to provide service for others	7	6	5	4	3	2	1
b. The chance to do lots of different things on my job	7	6	5	4	3	2	1
c. The chance to prepare food items	7	6	5	4	3	2	1
d. The physical surroundings where I work	7	6	5	4	3	2	1
e. The morale of my co-workers	7	6	5	4	3	2	1
f. My supervisors	7	6	5	4	3	2	1
g. My hours	7	6	5	4	3	2	1
h. My job overall	7	6	5	4	3	2	1

FOOD SERVICE WORKER INTERVIEW

WORKER INTERVIEW

1. What are the good aspects of your present job? (What do you like about it)
2. What are the bad aspects of your present job? (What do you dislike about it)
3. We asked you on the survey whether you preferred division food management or company/battalion level management of dining facilities. Which did you say you preferred.
4. Why?
5. Are there any (other) good things about DFM?
6. Are there any (other) bad things about DFM?
7. We asked you on the survey whether you would prefer CFPPF or the present system where food is completely prepared at each dining facility. Which did you say you preferred?
8. Why?
9. Are there any (other) good things you anticipate about CFPPF?
10. Are there any (other) bad things you anticipate about CFPPF?
11. Probe about
 - a) quality of food
 - b) working in the satellite facilities
 - c) equipment in the central facilities
 - d) worker morale
12. Have you had any training for the new system?

13. a) If yes, what kind
b) How good or bad was it (7 pts)
c) Should you have more
d) If, yes, in what areas
14. a) If no, should you have training?
b) If yes, in what areas?
15. Do you think DFM would work at other bases?
16. Do you think CFPF would work at other bases?

UNIT COMMANDER INTERVIEW

COMMANDER CFPF INTERVIEW

1. Type of Commander
2. Which system of management would you prefer for the management of Army Dining facilities, company/battalion level management or division food management? (7 pts)
3. Why?
4. Are there any (other) positive aspects of DFM?
5. Are there any (other) negative aspects of DFM?
6. Based on what you might have heard about the central food preparation facility, would you prefer it or the present system where food is completely prepared at each dining facility? (7 pts)
7. Why?
8. Are there any (other) positive aspects of CFPF?
9. Are there any (other) negative aspects of CFPF?
10. Probe about
 - 1) food quality
 - 2) food service worker morale
 - 3) going to the field with their cooks (if relevant)
11. Do you think DFM would work at other bases? Why (not)?
12. Do you think CFPF would work at other bases? Why (not)?

UNIT COMMANDER INTERVIEW

UNIT COMMANDER INTERVIEW

1. Name of Commander

2. Which aspect of management would you prefer for the management of this unit? (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)

3. Why?

4. Are there any (other) positive aspects of this?

5. Are there any (other) negative aspects of this?

6. Based on what you have said, would you prefer this management style? (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)

7. Why?

8. Are there any (other) positive aspects of this?

9. Are there any (other) negative aspects of this?

10. Would you

UNIT COMMANDER INTERVIEW

11. In your opinion, what are the most important factors in the management of this unit? (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)

12. In your opinion, what are the most important factors in the management of this unit? (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)

13. In your opinion, what are the most important factors in the management of this unit? (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)

FORT CARSON FOOD SERVICE WORKER SURVEY CHANGE

FORT CARSON FOOD SERVICE WORKER SURVEY CHANGE

19. Central Food Management System (CFMS): The CFMS has a single individual responsible for all food related elements on an installation to include equipment, personnel, facilities, and distribution system. The central manager for the food program, like other installation directors, reports directly to the Chief of Staff.

Which system would you prefer for the management of Army dining facilities, company/battalion level management or central food management?
(Circle one number)

1. Central food management much better
2. Central food management somewhat better
3. Central food management slightly better
4. About the same
5. Company/battalion management slightly better
6. Company/battalion management somewhat better
7. Company/battalion management much better

20. Central Food Preparation Facility (CFPF): The CFPF is an optional element of the Central Food Management System. The CFPF is designed to produce certain menu items and freeze them for storage at one central location for later reheating or other finishing and serving at the supported dining facilities on an installation.

Which system would you prefer, central food preparation as described above or the present system where food is completely prepared at each dining facility? (Circle one number)

1. Preparation at each facility much better
2. Preparation at each facility somewhat better
3. Preparation at each facility slightly better
4. About the same
5. Central preparation slightly better
6. Central preparation somewhat better
7. Central preparation much better

FORT LEE POST-TEST FOOD SERVICE WORKER

SURVEY CHANGE

FORT LEE POST-TEST FOOD SERVICE WORKER SURVEY CHANGE

19. Which system would you prefer for the management of Army dining facilities, company/battalion level management or division food management?
(Circle one number)

- 1 Division food management much better
- 2 Division food management somewhat better
- 3 Division food management slightly better
- 4 About the same
- 5 Company/battalion management slightly better
- 6 Company/battalion management somewhat better
- 7 Company/battalion management much better

20. Would you prefer the central food preparation facility or the traditional system where food is completely prepared at each dining facility?

- 1 Preparation at each facility much better
- 2 Preparation at each facility somewhat better
- 3 Preparation at each facility slightly better
- 4 About the same
- 5 Central preparation slightly better
- 6 Central preparation somewhat better
- 7 Central preparation much better

21. Using the scale below, please tell us how you feel about each of the following aspects of your job by circling the appropriate number for each factor.

7	6	5	4	3	2	1
Very Satisfied	Somewhat Satisfied	Slightly Satisfied	Neither Satisfied Nor Dis-satisfied	Slightly Dis-satisfied	Somewhat Dis-satisfied	Very Dis-satisfied

- | | | | | | | | |
|--|---|---|---|---|---|---|---|
| a. The chance to provide service for others | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| b. The chance to do lots of different things on my job | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| c. The chance to prepare food items | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| d. The physical surroundings where I work | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| e. The morale of my co-workers | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| f. My supervisors | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| g. My hours | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| h. My job overall | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

ANNEX F

CONSUMER OPINION MEASUREMENT

BEHAVIORAL SCIENCES DIVISION

NARADCOM

Consumer Opinion Measurement

Method

The NARADCOM-developed Consumer Opinion Card, exhibited in Figure 1, was used to obtain the consumer ratings. Twenty-four foods (17 entrees, 1 starch, and 6 vegetables) were surveyed under both self-sufficient (on-site preparation) and central preparation conditions. Self sufficient ratings were obtained first during November through mid-December 1977 and continuing in late January through mid-February 1978. A three-month transition period followed to allow technical start-up problems connected with the introduction of centrally-prepared foods to be resolved. Then, ratings were repeated on the same foods, beginning in late May and continuing through mid-July 1978.

Eight dining halls operated by Ft. Lee's Directorate of Food Management participated. They were assigned, two at a time, to the foods to be evaluated in a rotation. No one dining hall was visited more than twice per week, once for a noontime and once for an evening meal. Two dining halls per food were surveyed to (1) assure a sufficient number of ratings and (2) determine whether or not differences in consumer opinion would occur on the same item. During the evaluations of centrally-prepared foods, 12 other items were added (one soup, four salads, and seven desserts) that had been provided dining halls from a central location prior to construction of the CFPF.

Strict control was exerted during the self-sufficient phase to assure that the test items scheduled for surveying were actually served in the dining halls. The Master Menu was followed except when the Ft. Lee Installation Menu Board called for a substitution, usually of an equivalent item that would subsequently be evaluated under the central preparation condition. There was some data loss through failure to serve an item in a second dining

hall, failure of the item itself upon reheating, or decisions not to produce _____ centrally an item already evaluated under the self-sufficient condition. Such occurrences were, however, normal in experiments of this kind and were not serious. Enlisted personnel, sometimes from the Company personnel being surveyed and sometimes from the Quartermaster School, were recruited to hand out and retrieve completed Opinion Cards. During Summer 1978, civilian college students performed this task. Frequently, but not always, the personnel were female. It was observed that _____ personnel passing out cards had no effect on cooperativeness of consumers. Cards were only handed to those having the test item on their trays. Retrieval rate of completed cards ranged from 80 to 90 percent.

Completed Opinion Card Data were keypunched at Ft. Lee in accordance with instructions given in the NARADCOM Protocol. IBM data cards were then sent to NARADCOM for statistical analysis. For each food, a t-statistic was computed to compare on-site versus centrally prepared food ratings for the five characteristics. Means and standard deviations only were computed for foods evaluated under one or the other conditions.

Results and Discussion

Data for the 24 foods surveyed under both preparation conditions are exhibited in Table 1. Criteria for comparing the conditions were as follows: (1) serving temperature and portion size are largely controlled at time of serving in the dining hall under both conditions; or they are controlled by the size of a unit, e.g. a preformed salisbury steak piece or a chicken part, again, under both conditions. (2) Flavor, texture, and

overall opinion are largely influenced by preparation, whether on-site or central, and are sensory characteristics. Therefore, they are the primary criteria for whether the foods are alike or different in acceptability. The decision rule used was: if at least one of these characteristics was significantly different at $P = 0.05$ (95 percent confidence level), one condition was considered significantly different in acceptability from the other.

Table 1 indicated that, of the 24 foods surveyed under both conditions, on-site rated better than central preparation for 16. All but four of these 16 foods were entrees, and the outcome was significant for 10 (9 entrees and 1 vegetable). Five of the centrally-prepared foods rated better than on-site prepared; two of these outcomes were significant. Finally, three foods were virtually identical in acceptability.

There was concern at Ft. Lee about the overall negative direction centrally-prepared food ratings were taking compared with the initial self-sufficient condition (on-site) ratings. Furthermore, production problems had been encountered with some of the nine centrally-prepared entrees that were considered resolved following the dining hall evaluations. Therefore, it was decided to reevaluate them in the dining halls. This was accomplished in September 1978. For the statistical comparison, the original self-sufficient data was used. Roast beef, which had not been evaluated earlier under self-sufficient, was run in a Quartermaster School dining hall not under the Centralized Management System. Concurrently, the centrally-prepared product was run in a dining hall supplied by the ICFPF. Results are given in Table 2.

Table 2 indicates that there was no substantial improvement in the performance of centrally-prepared foods against the original baseline self-sufficient food ratings. The one exception was baked pork chops which represented a reversal of direction and significance as demonstrated both in this Table and Table 4. Table 4 provides the changes in magnitude, significance, and direction. For four items - beef stew, chicken cacciatore, creamed ground beef, and swiss steak - the direction and significance of the ratings was not only maintained, but the magnitude of the difference increased slightly. For two items - pork chop suey and roast pork - the outcome was significant in the first trial and nonsignificant for the second; however, the direction of the outcome was unchanged. Another two items, centrally-prepared chicken fried beef patties and chili con carne, were significantly lower-rated initially but the magnitudes of difference were small. The magnitudes and direction were maintained in the second trial. Finally, it was clear that centrally-prepared roast beef was not as acceptable as on-site prepared, even though the significance was borderline as indicated.

Between 10 and 25 percent of dining hall consumers volunteered comments on their opinion cards. A majority of these were non-specific about food quality and were negative which is typical of laboratory tests as well. Specific comments covered many topics and no central theme emerged for any of the 10 foods that differed significantly. The higher rated on-site prepared items received the same proportion negative comments as the lower rated centrally-prepared foods. Thus, comments provided little additional information or guidance and were not tabulated here. From their comments,

some of the dining hall patrons were obviously student cooks. Some wrote lengthy narrations about how the foods were executed. Nevertheless, these comments were also highly individual. Table 3 provides data on ICFPF foods only. No self-sufficient data was obtained against which to compare ratings for the entree and vegetable. The others have been produced centrally throughout the evaluation period and a measurement of "absolute acceptability" was desired. In general, ratings for the soup, salad, and dessert items surveyed were somewhat higher than for the other food groups surveyed. There were exceptions, however: (1) Salads: spiced peach was "slightly bad" and ratings were highly divergent as indicated by the standard deviations; in addition, there were insufficient responses to draw conclusions about acceptability of this and the orange and pineapple product; (2) Desserts: coconut cream pie was rated low with a high standard deviation; it was clear from written comments that the filling was watery and thin in texture, i.e., had broken down in the freeze-thaw processes. Cranberry crunch was borderline, but there were few comments to elucidate any quality problems.

Presented Table 5 is self-sufficient data on foods not subsequently evaluated under the central preparation. These data are presented for their information value. Some items, such as chicken vega, creole shrimp, spanish rice, and steak with onions indicated moderately-high acceptance and would be candidates for retention on the menu as well as central preparation, given that they are technically and economically feasible.

Initial statistical analyses revealed no instable differences between pairs of dining halls under either survey condition.

Summary and Conclusions

1. Of the 24 ICFFP foods evaluated, 16 were rated lower than their on-site prepared counterparts. The differences in acceptability for 10 of these 16 foods was statistically significant. The weight of evidence was that, based upon in-dining hall consumer measurements, there was an overall loss in acceptability when ICFFP foods were introduced. The loss was not dramatic; slippage was usually from one level of acceptability to another or, at worst, to a neutral opinion of the food. It is not known how serious this is in terms of system or consumer acceptance of ICFFP foods, i.e., the extent to which the foods themselves are utilized by the dining halls, the consumer utilizes the dining halls, and other factors.

2. A reevaluation of 10 centrally-prepared foods produced essentially the same results in direction and degree of acceptability, when these data were compared with the original self-sufficient ratings. In four instances the magnitude of the difference increased.

3. Ratings for other items such as salads and desserts that had been produced centrally before the ICFFP came on-stream revealed some acceptance problems.

4. Ft. Lee Sensory Quality Panel data for the foods cited in summary items 1 and 3 can be scrutinized carefully for sensory defects that may have been observed on the same batches of products surveyed in the dining halls.

5. Selected ICFFP foods can be acceptability-tested against recipe card formulas in a laboratory setting at NARADCOM to isolate the effect of the food itself.

CONSUMER OPINION CARD

FOOD ITEM: _____ (11-20)

After you have eaten this item, rate it on the following characteristics. Select the ONE phrase that best describes your opinion of each and darken the box beside it.

Temperature (21)	Flavor (22)	Portion Size (23)	Texture (24)
Much Too Hot <input type="checkbox"/> 7	Very Good Flavor <input type="checkbox"/> 7	Much Too Big <input type="checkbox"/> 7	Very Bad Texture <input type="checkbox"/> 7
Too Hot <input type="checkbox"/> 6	Good Flavor <input type="checkbox"/> 6	Too Big <input type="checkbox"/> 6	Bad Texture <input type="checkbox"/> 6
Slightly Too Hot <input type="checkbox"/> 5	Slightly Good Flavor <input type="checkbox"/> 5	Slightly Too Big <input type="checkbox"/> 5	Slightly Bad Texture <input type="checkbox"/> 5
Just Right <input type="checkbox"/> 4	Neutral Flavor <input type="checkbox"/> 4	Just Right <input type="checkbox"/> 4	Neutral Texture <input type="checkbox"/> 4
Slightly Too Cold <input type="checkbox"/> 3	Slightly Bad Flavor <input type="checkbox"/> 3	Slightly Too Small <input type="checkbox"/> 3	Slightly Good Texture <input type="checkbox"/> 3
Too Cold <input type="checkbox"/> 2	Bad Flavor <input type="checkbox"/> 2	Too Small <input type="checkbox"/> 2	Good Texture <input type="checkbox"/> 2
Much Too Cold <input type="checkbox"/> 1	Very Bad Flavor <input type="checkbox"/> 1	Much Too Small <input type="checkbox"/> 1	Very Good Texture <input type="checkbox"/> 1

What is your OVERALL OPINION of this item? (25)

<input type="checkbox"/> 7	<input type="checkbox"/> 6	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
Very Good	Good	Slightly Good	Neutral	Slightly Bad	Bad	Very Bad

COMMENTS:

Army-Fort Lee, Va. -11049-78-3M-1

Please drop this card in the box by the entrance to the dishwashing area. Thank you.
TSA Form 65 (30 Aug 78)

Table 1. Ft. Lee Dining Hall Food Ratings

Foods Surveyed	Mealtime	Preparation	Number of Responses	Characteristics				Overall Opinion
				Serving Temperature	Flavor	Portion Size	Texture	
<u>Entrées:</u>								
Baked Lasagna	L	OS CP	105 168	3.8 ± 0.9 3.6 ± 1.0	5.0 ± 1.6 5.1 ± 1.5	3.4 ± 1.2* 3.0 ± 1.2	4.7 ± 1.6 4.8 ± 1.6	5.2 ± 1.6 5.2 ± 1.6
Baked Pork Chops	D	OS CP	123 90	3.2 ± 0.9 3.3 ± 1.1	4.6 ± 1.6** 3.9 ± 1.8	2.9 ± 1.1 3.1 ± 1.1	4.2 ± 1.8 4.0 ± 2.0	4.6 ± 1.6** 3.9 ± 1.7
Barbecued Spare-ribs	D	OS CP	122 88	3.1 ± 1.0 3.6 ± 0.9*	4.4 ± 1.8 5.0 ± 1.5*	3.0 ± 1.1 2.9 ± 1.1	4.1 ± 1.7 4.5 ± 1.8*	4.3 ± 1.7 4.9 ± 1.8*
Beef Stew	L	OS CP	80 92	4.1 ± 0.8** 3.6 ± 0.8	5.3 ± 1.3** 4.6 ± 1.7	3.5 ± 0.8 3.7 ± 1.0	5.0 ± 1.5** 4.3 ± 1.8	5.4 ± 1.4** 4.7 ± 1.7
Braised Beef Cubes	D	OS CP	93 73	3.7 ± 0.9 3.8 ± 1.1	5.0 ± 1.7 4.8 ± 1.8	3.7 ± 1.2 3.6 ± 1.1	4.5 ± 1.8 4.7 ± 1.7	5.1 ± 1.7 4.9 ± 1.8
Chicken Cacciatore	D	OS CP	82 84	3.9 ± 0.7 3.8 ± 0.9	5.2 ± 1.5 5.0 ± 1.7	3.9 ± 0.9** 2.8 ± 1.2	5.1 ± 1.6 4.7 ± 1.8	5.4 ± 1.4* 4.9 ± 1.7
Chicken Fried Beef Patties	L	OS CP	112 105	3.8 ± 0.9 3.6 ± 0.7	5.2 ± 1.5* 4.8 ± 1.4	3.4 ± 1.1 3.6 ± 0.9	4.8 ± 1.6 4.6 ± 1.5	5.3 ± 1.6 5.0 ± 1.7
Chili Con Carne	L	OS CP	103 135	3.6 ± 0.7 4.1 ± 1.1**	5.2 ± 1.5 5.0 ± 1.6	3.3 ± 1.2 3.2 ± 1.3	5.0 ± 1.3 4.8 ± 1.6	5.5 ± 1.3* 5.1 ± 1.6
Country Style Chicken	D	OS CP	124 70	3.9 ± 0.5 4.0 ± 0.7	5.8 ± 1.4 5.6 ± 1.2	3.3 ± 1.0 3.3 ± 1.2	5.4 ± 1.5 5.1 ± 1.3	5.9 ± 1.3 5.7 ± 1.0
Creamed Ground Beef	B	OS CP	44 54	4.0 ± 0.8 3.8 ± 0.5	5.5 ± 1.2* 4.9 ± 1.8	4.0 ± 0.6 3.8 ± 0.8	5.4 ± 1.3* 4.8 ± 1.5	5.8 ± 1.0* 5.2 ± 1.7

Table 1 (Continued)

Foods Surveyed	Meat/line	Preparation	Number of Responses	Serving Temperature	Flavor	Portion Size	Texture	Overall Opinion
Entrees (Cont'd)								
Meatloaf, Mushroom Brown Gravy	L	OS CP	74 84	3.5 ± 0.8 3.6 ± 0.8	4.8 ± 1.9 5.0 ± 1.6	3.1 ± 1.2 3.1 ± 1.1	4.5 ± 1.9 5.0 ± 1.5	4.7 ± 1.9 4.9 ± 1.7
Pork Chop Suey	L	OS CP	58 89	3.9 ± 0.7 3.9 ± 0.9	5.4 ± 1.5** 4.7 ± 1.5	3.7 ± 1.2 3.8 ± 1.0	5.3 ± 1.5** 4.6 ± 1.6	5.8 ± 1.5** 4.9 ± 1.6
Roast Pork	D	OS CP	106 85	3.4 ± 0.8 3.5 ± 1.0	4.8 ± 1.5* 4.3 ± 1.8	3.4 ± 1.0 3.4 ± 1.2	4.8 ± 1.4* 4.3 ± 1.7	4.8 ± 1.5 4.7 ± 1.7
Salisbury Steak, Tomato Gravy	L	OS CP	130 169	3.4 ± 0.9** 3.8 ± 0.8	4.7 ± 1.8 5.1 ± 1.6*	3.4 ± 1.0 3.3 ± 1.0	4.2 ± 1.9 5.0 ± 1.6**	4.6 ± 1.9 5.4 ± 1.6**
Savory Baked Chicken	D	OS CP	198 193	3.4 ± 0.9 3.7 ± 0.7**	5.1 ± 1.6 4.8 ± 1.6	2.8 ± 1.1 3.0 ± 1.1	4.9 ± 1.6 5.0 ± 1.5	5.0 ± 1.7 5.1 ± 1.6
Swiss Steak Brown Gravy	D	OS CP	197 184	3.7 ± 0.9 3.6 ± 0.9	5.3 ± 1.4** 4.6 ± 1.6	3.6 ± 1.0** 3.4 ± 1.0	4.8 ± 1.6** 4.4 ± 1.7	5.5 ± 1.4** 4.8 ± 1.7
Veal Parmesan	D	OS CP	42 102	3.7 ± 0.5 3.6 ± 0.7	5.4 ± 1.4 5.1 ± 1.4	3.6 ± 0.9 3.5 ± 0.9	4.8 ± 1.8 4.6 ± 1.6	5.6 ± 1.5 5.2 ± 1.3
Starch:								
Baked Beans	D	OS CP	95 96	3.9 ± 0.8 3.9 ± 1.1	5.2 ± 1.3 5.1 ± 1.8	3.8 ± 1.0 3.7 ± 1.3	5.1 ± 1.4 4.8 ± 1.5	5.4 ± 1.4 5.2 ± 1.8
Vegetables:								
Broccoli Polonaise	L	OS CP	18 40	3.2 ± 1.1 3.4 ± 0.9	4.8 ± 1.7 5.0 ± 1.4	4.3 ± 1.5 3.9 ± 0.9	4.3 ± 1.6 5.1 ± 1.4	5.1 ± 1.8 5.6 ± 1.6
Carrots Normandise	L	OS CP	25 47	3.8 ± 0.8 3.8 ± 0.7	5.4 ± 1.7 4.9 ± 1.7	3.4 ± 1.1 3.9 ± 0.7*	5.2 ± 1.5** 4.2 ± 1.8	5.2 ± 1.8 5.0 ± 1.7

Table 1 (Continued)

Foods Surveyed	Mealtime	Preparation	Number of Responses	Serving Temperature	Flavor	Portion Size	Texture	Overall Opinion
Vegetables (Cont'd)								
Corn O'Brien	L	OS	63	3.9 ± 0.6	5.7 ± 1.5	3.8 ± 0.7	5.5 ± 1.5	5.9 ± 1.3
		CP	48	4.0 ± 0.6	5.2 ± 1.4	3.9 ± 0.7	5.1 ± 1.5	5.6 ± 1.3
French Fried Cauliflower	L	OS	55	3.1 ± 1.1	5.0 ± 1.8	3.7 ± 1.2	4.6 ± 1.7	5.1 ± 1.8
		CP	60	3.7 ± 0.7**	5.3 ± 1.4	3.6 ± 1.0	5.0 ± 1.5	5.6 ± 1.5
Harvard Beets	D	OS	24	3.8 ± 0.8	5.3 ± 1.5	3.8 ± 0.8	5.1 ± 1.5	5.5 ± 1.4
		CP	24	4.0 ± 0.5	5.2 ± 1.6	4.2 ± 0.8	5.0 ± 1.6	5.5 ± 1.5
Sautéed Corn	D	OS	53	3.4 ± 0.9	4.7 ± 1.4	3.6 ± 0.9	4.8 ± 1.5	5.0 ± 1.4
		CP	97	3.5 ± 0.8	4.7 ± 1.6	3.5 ± 1.0	4.5 ± 1.6	4.8 ± 1.7

Table Reevaluation of Selected Centrally-Prepared Ex. es.

Entree	Mealtime	Preparation	Number of Responses	Characteristics Rated				
				Serving Temperature	Flavor	Portion Size	Texture	Overall Opinion
Baked Pork Chops	D	OS	123	3.2±0.9	4.6±1.6	2.9±1.0	4.2±1.8	4.6±1.6
		CP	147	3.5±1.0**	4.8±1.7	3.0±1.1	4.5±1.8	5.0±1.7**
Beef Stew	L	OS	80	4.1±0.9	5.3±1.4**	3.5±0.8**	5.0±1.6**	5.4±1.4**
		CP	120	3.9±1.2	4.4±1.9	3.9±1.3	4.4±1.9	4.6±2.0
Chicken Cacciatore	D	OS	82	3.9±0.7**	5.1±1.5**	3.8±0.9**	5.0±1.6	5.4±1.4**
		CP	139	3.5±1.1	4.5±1.9	2.8±1.3	4.7±1.7	4.7±1.8
Chicken Fried Beef Patties	L	OS	112	3.8±0.9**	5.2±1.5	3.4±1.0	4.8±1.6	5.3±1.6
		CP	141	3.5±1.0	5.0±1.6	3.6±1.1	4.6±1.7	5.1±1.9
Chili Con Carne	L	OS	103	3.6±0.7	5.2±1.4	3.3±1.2	5.0±1.3	5.5±1.3
		CP	154	4.1±1.0**	4.9±1.8	3.8±1.2**	4.7±1.7	5.2±1.5
Creamed Ground Beef	B	OS	44	4.0±0.8	5.5±1.2**	4.0±0.6**	5.4±1.2	5.8±1.0**
		CP	36	3.9±0.9	4.6±1.7	3.6±1.1	4.9±1.7	5.0±1.8
Pork Chop Suey	L	OS	58	3.9±0.7	5.4±1.5	3.7±1.2	5.3±1.5	5.8±1.5
		CP	127	3.8±1.0	5.1±1.6	3.9±1.2	4.9±1.8	5.3±1.7
Roast Beef	D	OS	40	3.2±0.9	4.7±1.4	3.4±1.1	4.9±1.4**	5.0±1.4
		CP	68	3.2±1.2	4.5±1.8	3.3±1.4	4.3±2.0	4.4±1.8
Roast Pork	D	OS	50	3.4±0.7	4.9±1.5	3.2±1.0	4.7±1.5	4.8±1.5
		CP	88	3.1±1.1	4.7±1.7	3.2±1.3	4.7±1.8	4.9±1.9
Swiss Steak, Brown Gravy	D	OS	197	3.7±0.9**	5.3±1.4**	3.6±1.0**	4.9±1.6**	5.5±1.4**
		CP	121	3.3±1.0	4.6±1.6	3.1±1.2	4.2±1.8	4.4±1.8

Table 3. Consumer Surveys of Centrally-Prepared Foods, Ft. Lee, Virginia

Food Item	Mealtime	Number of Responses	Characteristics Rated				Overall Opinion
			Temperature	Flavor	Portion Size	Texture	
<u>Entree:</u>							
Roast Beef with Gravy	D	75	3.6 ± 0.8	4.9 ± 1.4	3.5 ± 1.2	4.5 ± 1.6	4.8 ± 1.7
<u>Vegetable:</u>							
French Fried Eggplant	L	63	3.6 ± 1.0	4.3 ± 1.7	3.5 ± 0.9	4.3 ± 1.8	4.6 ± 2.0
<u>Soup:</u>							
Vegetable	L	34	4.1 ± 1.0	5.1 ± 1.9	4.1 ± 1.1	5.1 ± 1.6	5.2 ± 1.8
<u>Salads:</u>							
Jellied Pear	L	34	4.4 ± 0.8	5.7 ± 1.5	3.8 ± 1.1	5.6 ± 1.6	5.9 ± 1.7
Orange & Pineapple	L	16	4.1 ± 0.6	5.6 ± 1.1	3.8 ± 0.5	5.2 ± 1.3	5.6 ± 1.3
Pineapple & Pear	L	33	3.8 ± 0.8	5.2 ± 1.5	3.8 ± 0.8	5.1 ± 1.6	5.5 ± 1.4
Spiced Peach	L	16	3.9 ± 1.0	3.2 ± 2.0	3.8 ± 0.8	3.9 ± 2.2	3.4 ± 2.1
<u>Desserts:</u>							
Apple Pie	L	169	3.0 ± 1.1	5.0 ± 1.8	3.4 ± 1.2	4.6 ± 1.8	5.0 ± 1.8
Blueberry Pie	L	88	3.5 ± 0.9	5.7 ± 1.4	3.4 ± 1.1	5.1 ± 1.7	5.6 ± 1.5
Coconut Cream Pie	L	61	3.2 ± 1.2	4.0 ± 1.9	3.3 ± 1.0	3.2 ± 1.8	3.9 ± 2.0

Table 3 (Continued)

Food Item	Mealtime	Number of Responses	Temperature	Flavor	Portion Size	Texture	Overall Opinion
<u>Desserts (Cont'd)</u>							
Cranberry Crunch	L	40	3.4 ± 1.0	4.5 ± 1.7	3.7 ± 1.5	4.8 ± 1.6	4.8 ± 1.8
Quick Coffee Cake	B	40	3.6 ± 0.7	6.1 ± 0.7	3.9 ± 0.4	5.4 ± 1.3	6.0 ± 0.9
Peach Pie	L	127	3.7 ± 1.0	5.7 ± 1.6	3.4 ± 1.0	5.3 ± 1.5	5.8 ± 1.4
Yeast Donuts	B	86	3.7 ± 0.9	5.3 ± 1.4	3.7 ± 0.7	5.0 ± 1.4	5.3 ± 1.4

Table 4. Comparison of Trial 1 and Trial 2 Results, ICFPF Foods^a

Entree	Trial 1			Trial 2		
	Flavor	Texture	Overall Opinion	Flavor	Texture	Overall Opinion
	*** Size of Difference, Scale Points ***					
Baked Pork Chops	0.7	0.2 ^b	0.7	-0.2 ^b	-0.3 ^b	-0.4
Beef Stew	0.7	0.7	0.7	0.9	0.6	0.8
Chicken Cacciatore	0.2 ^b	0.4 ^b	0.5	0.6	0.3 ^b	0.7
Chicken Fried Beef Patties	0.4	0.3 ^b	0.3 ^b	0.2 ^b	0.2 ^b	0.2 ^b
Chilli Con Carne	0.2 ^b	0.2 ^b	0.4	0.3 ^b	0.3 ^b	0.3 ^b
Creamed Ground Beef	0.6	0.6	0.6	0.9	0.5 ^b	0.8
Pork Chop Suey	0.7	0.7	0.9	0.3 ^b	0.4 ^b	0.5 ^b
Roast Beef	c	c	c	0.2 ^b	0.6 ^d	0.6 ^d
Roast Pork	0.6	0.6	0.1 ^b	0.2 ^b	-0-	-0.1 ^b
Swiss Steak, Brown Gravy	0.7	0.4	0.7	0.7	0.5	1.1

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Footnotes

a) Positive differences in Table indicate on-site prepared foods were rated higher than the ICFPF foods subsequently introduced into dining halls. Comparison in both trials was with the same on-site food ratings. Negative differences in Trial 2 indicate a reversal of direction favoring ICFPF foods.

b) Difference not significant. Numbers not followed by a superscript are significantly different at $P \leq 0.05$.

c) Self-sufficient data not obtained prior to Trial 1.

d) Significance level was $0.05 \leq 0.10$, very close to the preset level indicated in Footnote b.

Table 5. Foods Evaluated Under Self-Sufficient Condition Only*

Food	Mealtime	Number of Responses	Characteristics Rated				Overall Opinion
			Serving Temperature	Flavor	Portion Size	Texture	
Chicken Vega	L	89	3.9±0.8	5.4±1.5	3.6±1.0	5.1±1.6	5.5±1.3
Creole Shrimp	L	67	3.9±0.8	5.3±1.6	3.7±1.2	4.9±1.6	5.5±1.7
French Baked Potatoes	D	55	2.8±1.0	4.3±1.7	3.2±1.7	3.9±1.7	4.1±1.8
Golden Potato Balls	L	26	3.6±1.0	4.7±2.0	3.5±1.0	3.4±2.3	4.8±2.1
Spanish Rice	D	78	3.6±0.8	5.2±1.5	3.1±1.1	4.8±1.7	5.2±1.3
Steak with Onions	D	101	3.8±0.6	5.3±1.2	3.4±1.0	4.9±1.4	5.6±1.3
Stuffed Beef Rolls	D	131	4.2±1.0	5.1±1.6	3.5±1.0	4.4±1.7	5.1±1.6

*French Baked Potatoes were produced by the ICFPF, but disintegrated when reheated in the fryer. All others were not produced, although production guides existed for them. Roast Turkey (not listed) was surveyed as a hot sandwich item. It rated in the "slightly good to good" range. However, there were no plans for producing centrally in sandwich form. Thus, numerical data are not relevant.

ANNEX G

QUALITY CONTROL/QUALITY ASSURANCE

VETERINARY STAFF OFFICE

TSA

CENTRAL FOOD PREPARATION SYSTEM
AFTER ACTION REPORT
QUALITY CONTROL/QUALITY ASSURANCE

EXECUTIVE SUMMARY

A quality control organization, Technical Support Office (TSO), was established within the Directorate of Food Management to oversee performance and recommend changes with regard to food quality. The emphasis of the TSO was primarily food wholesomeness and secondarily esthetic and physical characteristics of the food. The Technical Support Office was limited in its effectiveness at the early stages by two factors: lack of managerial emphasis on control of production procedures and an extensive period of insufficient supervision over the activities of the TSO. It was only during the months of Aug and Sep that the TSO began to exert significant influence over the actions taken by the Central Food Preparation Division. The TSO did not at any time during the evaluation have a significant influence over the functions of the Dining Facilities Operations Division.

The potential for maximizing food quality that existed in the TSO was not fully realized. The level of influence that the TSO did attain, demonstrated that an operation of the nature and complexity of the CFPS could not be expected to be successful without provisions for quality control.

Quality assurance for wholesomeness was joint endeavor by the TSO and the Deputy for Veterinary Activities, Ft Lee MEDDAC. The TSO provided daily surveillance for sanitation and analyzed the centrally prepared foods for microbiological quality. The Deputy for Veterinary Activities provided periodic inspections for sanitation and was the final authority in questions of food wholesomeness. Condemnation of food deemed to be unwholesome by laboratory analysis or by observation was the responsibility of the Deputy for Veterinary Activities.

INTRODUCTION

The evaluation, as outlined (Appendix I, Evaluation Plan, Central Food Preparation System, CS-SD-7713, 27 Feb 78), consisted of observation of the operation of the TSO and its interactions with the other major divisions of DFM and with the Ft Lee MEDDAC to derive an accurate description of the quality control/quality assurance effort.

Quality control/quality assurance activities began with the initial salad preparation function in the Central Ingredient Preparation Facility in early 1975 and have continued in an unbroken line until the present. This evaluation deals with the period January 1978 through September 1978.

OBSERVATIONS AND FINDINGS

1. Organization of the Technical Support Office:

The Technical Support Office (TSO) was organized within the Directorate of Food Management (DFM). The Chief, TSO, was directly responsible to the

Director, DFM. During the CFPS evaluation, the TSO was organized into the office of the Chief, the Inspection Branch, and the Laboratory Branch. An internal sanitation team was included on the TDA of the TSO. Operationally, this crew of clean-up and janitorial personnel was under the control of the central facility management and not under the TSO.

2. Personnel Assigned/Attached to the Technical Support Office:

Only the Chief, and the internal sanitation team were assigned to the TSO. The remaining personnel were either assigned to the Ft Lee MEDDAC (two enlisted veterinary food inspectors, one environmental health specialist, three laboratory personnel) or "on loan" from elsewhere within DFM (one officer, QMC).

The Technical Support Office consisted of the Chief, and one officer. The food inspection and environmental science personnel were assigned to Inspection Branch and the three laboratory personnel made up the Laboratory Branch. Seven personnel were employed in the Internal Sanitation Team.

The personnel in the Inspection Branch and the Laboratory Branch were assigned to the Fort Lee MEDDAC and attached for duty with DFM. The assignment of these individuals was a subject of much controversy in that it was felt that the personnel responsible for quality control could not function if the Director, DFM, could not direct their actions. This consideration was in conflict with policies of the OTSG which stipulated that personnel (military or civilian) in a medical-type career field should not routinely be assigned to any organization other than a medical unit. This problem was resolved by having those individuals required to provide quality control for DFM and who were in a medical-type career field assigned to the "Food Service Test Support Element" which was organized within the Ft Lee MEDDAC. The mission of the Element was to support DFM. This situation did not address the basic issue of who would control the day-to-day activities of these personnel, and further, placed the Ft Lee MEDDAC Commander in a clear conflict of responsibility.

On the one hand, he would be responsible for providing the detailed quality control for DFM thereby actually being an integral part of the management of the central facilities and of the troop dining facilities on Ft Lee. On the other hand, he would have the police-oriented responsibility given him by regulation to take whatever action he deemed necessary in the event of a food-borne disease outbreak. These conflicting responsibilities would place the MEDDAC Commander in a position of criticizing himself and would severely limit his freedom of action to protect the health of the Command.

The situation was resolved locally at Ft Lee by means of an Intra-Service Support Agreement (ISSA) between the Ft Lee MEDDAC and the Quartermaster Center and Ft Lee. The ISSA, although also dealing with several unrelated operational questions, served to partially define the responsibilities of the MEDDAC and the DFM with respect to food safety. The ISSA and supporting memoranda also provided a means for the Director, DFM, to control and direct the day-to-day activities of the Food Service Test Support Element personnel.

3. Operations of the Technical Support Office:

The TSO was responsible for overseeing the quality and wholesomeness of the food from the time it was issued from the Troop Issue Subsistence Activity (TISA) to the central facilities until it was served to the diner in a dining facility.

Actions performed in the discharge of this responsibility included: examining the foods at time of issue from TISA to evaluate the suitability for processing; monitoring the processing procedure for correctness; monitoring sanitation on a constant basis; verifying the accuracy of weight, measurement, and composition of ingredients and of finished product; verifying label accuracy; selecting samples; performing laboratory analyses; maintaining physical control over rejected/questionable lots; reviewing procedures for alternative processing techniques; gathering and analyzing consumer and sensory panel feedback data; and recommending changes in production techniques, ingredients, etc., to the Chief, CFPD.

4. Laboratory Operations:

The Food Quality Control Laboratory was established primarily as a microbiology laboratory and was operated by DFM. Only limited chemical testing was deemed necessary, although numerous chemical tests exist that could have been employed if the food quality had required that degree of control. An example of chemical testing that was performed on occasion was to test in-coming ground beef for fat content. Ground beef with excessive fat could not be processed into patties and adversely affected the yield of ground beef products.

Because it was felt that the most significant risk to the CFPS was posed by the potential for food-borne disease, the laboratory was designed, staffed, and operated to detect and enumerate human pathogenic organisms and indicators of filth and contamination. A "Laboratory Procedure Manual" was developed for use by DFM.

Routine microbiological analyses were employed to detect and enumerate: E. Coli, Staphylococcus Aureus, Salmonella, Clostridium Perfringens, and yeasts and mold. In addition, the Standard Plate Count Technique and testing for Coliforms were employed as an index to the overall bacterial quality of the foods.

Decisions as to the suitability for issue of finished product (bacteriological quality) were based upon the Medical Advisory Committee Guidelines promulgated in 1974 and updated for Clostridium Perfringens in Nov 78.

When a food was found to exceed the guidelines the lot was immediately placed on hold by the Chief, TSO. The laboratory then would retest the lot to confirm the original findings. If the original findings appeared to be in error, i.e., the retest did not reveal any problems, the lot would be released for consumption without further action. If, however, the retest confirmed the original findings, the Deputy for Veterinary Activities was asked to review the findings and to condemn the lot if deemed appropriate. Further actions taken when the retest confirmed that the guidelines were exceeded included a comprehensive review of the product operational guide, analysis of raw components, and a detailed examination of production procedures. These actions were all aimed at locating the cause(s) of the high microbial counts and correction of the problem for subsequent production lots.

5. Inspection Operations:

The Inspection Branch of the TSO provided the on-site surveillance of the production techniques in the central facilities, the more technical aspects of food quality assessment, the routine evaluation of sanitation, and the verification of ingredient weights, measures, and composition. The inspection personnel were all veterinary food inspection and environmental health specialists. These military skills were selected since they were the most closely related to the skills required to provide quality control.

Extreme difficulty was encountered by the individuals staffing the Inspection Branch in relating their past military experience to the quality control function of CFPS. There was no question that the individuals were highly skilled in their MOS, commensurate with their rank, nor was there any question of their ability to function in the usual veterinary or preventive medicine environment. However, the quality control function required a degree of expertise in food processing techniques and a decision-making ability that is ordinarily not found in the MOS's represented (91R and 91S).

This fact, coupled with the fact that at no time during the evaluation did production procedures stabilize sufficiently to enable the development of a well defined inspection protocol, contributed to confusion, disillusionment, and frequent ineffectiveness on the part of the inspection staff. These conditions lasted generally until mid-1978.

In mid-1978 the inspection staff began to receive more specific tasking with regard to their duties. This tasking (relating to such things as sampling procedures, verification of weights and measures, documentation of actual production activities, and others) not only provided a sense of worth to the inspection job, but also provided the TSO with concrete information needed to determine where changes were required in components and processing methods.

The question of whether or not the inspection staff would be adequate in skills or number in a follow-on CFPS cannot be adequately addressed. The configuration and layout of the facilities at Ft Lee and the extensive learning process involving quality control prevent any reasonable extrapolation of the staffing of the TSO Inspection Branch of the Ft Lee DFM to another CFPS installation. It was felt that the staff of two 91R Veterinary Food Inspectors and one 91S Preventive Medicine Specialist was insufficient to provide the degree of on-site surveillance required by the Ft Lee CFPS.

6. Sensory Evaluation:

The sensory and esthetic properties of the centrally prepared foods were monitored through the use of a sensory evaluation panel.

The mission of the panel was to first determine on a lot-by-lot basis whether or not the individual lot was suitable for issue and to secondly determine if any changes to end item quality should be made and to identify those changes.

It was felt that in order to accomplish its mission and to provide realistic feedback, the panel should not be highly discriminatory, but rather, be capable of detecting large variations in quality. The training provided by MARADCOM for the panelists was geared toward the detection of those large variations.

The sensory evaluation panel contributed significantly to the overall quality control effort. The panel determinations and findings were used to continually upgrade the sensory and esthetic properties of the foods produced.

Prior to the next production run for a given item, the panel findings were used to modify formulations, ingredients, and procedures.

At no time during the evaluation were there standards for the sensory and esthetic qualities of the centrally prepared foods. The quality goals sought were those of producing foods that were first acceptable and secondly that were comparable to like items prepared by experienced cooks using TM 10-412 recipes in a dining facility. As production experience was gained, those goals were close to attainment toward the end of the evaluation.

7. Interface with the Fort Lee Veterinary Activity:

The Deputy for Veterinary Activities, acting on behalf of the Commander, Medical Department Activity, Fort Lee, in the discharge of his regulatory responsibility to protect the health of the Command, worked closely with the Chief, TSO, throughout the evaluation.

Both the Deputy for Veterinary Activities and the Chief, TSO, utilized the results of the DFM Quality Control Laboratory in making decisions regarding wholesomeness.

The Deputy for Veterinary Activities established an informal program of drawing paired samples and sending one to the Medical Laboratory at Ft Meade, MD, and the other to the DFM Food Quality Control Laboratory. The results from the two laboratories would then be compared. It was concluded from these comparisons that the results obtained from the DFM Laboratory were accurate and could be used for the condemnation of centrally prepared foods when required.

The Deputy for Veterinary Activities provided surveillance of the sanitary conditions in the central facilities to assure himself that conditions were adequate and to provide back up for the continuous surveillance maintained by TSO.

Despite the close working relationship between the Deputy for Veterinary Activities and the Chief, TSO, it was felt by both the Deputy for Veterinary Activities and the Veterinary Staff Office of TSA that the Deputy for Veterinary Activities had insufficient influence over the operation of the central facilities. Several instances of serious public health significance occurred that could well have been prevented if the Deputy for Veterinary Activities had been given additional authority and influence during the evaluation. The most notable of these involved the production of roast meat which became contaminated with Clostridium Perfringens. Serious errors were made in controlling times and temperatures during production permitting the organism to flourish and attain levels as high as 40,000/gm. The errors occurred with the knowledge and consent of the TSO quality control personnel who subverted their better judgment in the interest of maintaining production goals. It is felt that this and other similar situations would not have taken place had an independent authority been present during production.

8. Lessons Learned.

a. The major lesson learned from the evaluation of the quality control/quality assurance (QC/QA) system of the Central Food Preparation System is that the production and distribution of the safe foods of acceptable quality is a complex undertaking requiring detailed coordination between production personnel and quality control/quality assurance personnel. That coordination must be based upon clear statements of responsibility for each participant

and be directed toward the common goals of preparing and distributing foods that meet whatever standards that have been set for them.

Basically, there are three participants in a CFPS involved in the central preparation and distribution of foods: the facility production manager, the QC/QA supervisor, and the public health authority. The broad responsibilities of each of these are:

1) The production manager is responsible for transforming the ingredients furnished him into specified end items. His is the most crucial role because it is the way in which that transformation takes place that determines end item quality.

2) The quality control/quality assurance supervisor is responsible for providing continuous monitoring of the transformation by examining specific parameters during production in order to provide feedback to the production manager. That feedback should enable the production manager to determine which, if any, production process is out of tolerance and to make the necessary adjustments to bring it back into tolerance. The QC/QA supervisor is also responsible for the examination of end items to detect any which do not conform to specification.

The relationship between the production manager and the QC/QA supervisor is essentially antagonistic. Therefore, in order to not subvert the quality control function to the pressures of production, the QC/QA supervisor should not work for the production manager. The ideal situation is one in which the QC/QA supervisor and the production manager are on an equal plane of authority within the organization and both answer to the same individual. It will be that individual, in the case of DFM, the Director himself, who establishes the common goal essential for adequate coordination between production and quality control.

3) The public health authority is responsible for preventing the distribution of unwholesome foods. The public health authority; in the case of CFPS, the Deputy for Veterinary Activities, is independent of the organization operating the CFPS. His authority stems from regulations and public law and he is free to establish whatever inspection procedures deemed necessary to detect violation of those laws and regulations.

b. In an attempt to provide adequate understanding of quality control as opposed to quality assurance and to provide sufficient surveillance of public health matters during the growth of CFPS and its subsequent evaluation two crucial definitions were developed and used.

1) Quality Control: "A system enabling management to monitor and make adjustments to the operation."

2) Quality Assurance: "A system enabling an outside interest to assess the risk and probability of malfunction in the quality control system with regard to product wholesomeness."

During the evaluation, it was found that these definitions, while adequately describing vital functions, tended to hamper essential coordination. The problem was that quality assurance was found to be an internal function

performed by the QC/QA members of the organization and not the responsibility of an outside interest as described by the definition. The definition also limited quality assurance to food safety. Quality assurance was found to be essential to all product characteristics from net weight and labeling to microbiological quality.

The following definitions regarding quality control and quality assurance evolved during the evaluation.

1) Quality Control: "A system to provide feedback to the production manager regarding the quality of raw materials and the performance of the production operations, as measured against predetermined quality levels or processing parameters. Quality control measurements or observations are taken or made before and during production."

2) Quality Assurance: "A system for the examination of end items to measure the actual quality of the finished product and to compare that quality to predetermined quality standards. The purpose of quality assurance is first to detect substandard product and to prevent its distribution; and secondly to assess the overall performance of the production and quality control systems.

c. A major deficiency that surfaced during the evaluation was the lack of accurate standards or operational parameters by which to measure the performance of the operation. The extensive efforts on the part of TSA, DFM, and NARADCOM to develop operational guides were undertaken to provide operational parameters for production processes. The guides would have been more successful in achieving their purpose had they been developed on-site using the raw materials and equipment that would be used during production. Throughout the evaluation it was necessary to modify raw ingredients, formulations and production procedures. The lack of accurate operational procedures hindered production management and the QC/QA supervisor in controlling production and in assessing the performance of that production. That hindrance was felt in three major areas: end item yields, sensory quality, and food safety.

CONCLUSIONS

1. Large scale centralized food preparation poses a significant health risk to diners unless positive steps are taken to control wholesomeness.

2. It is possible to control the risk of foodborne illness in a large scale food preparation system.

3. Timely and accurate laboratory results are required prior to the issue of centrally prepared foods as a final safety measure.

4. The continuous presence of an independent authority is required to assure that good manufacturing practices as pertain to public health are not subverted in the interest of attaining production goals.

5. Large scale centralized food preparation requires a positive and reliable feedback system to be used in controlling the sensory and esthetic quality of the foods.

6. The use of a sensory panel is a reasonable means of providing the feedback for sensory and esthetic quality.

RECOMMENDATIONS

In the event the centralized food preparation concept is adopted for the US Army Food Service System, the following recommendations are provided with regard to food quality control.

1. That the matter of wholesomeness be addressed by using the techniques utilized in the US Department of Agriculture Meat and Poultry Inspection Program.

a. The responsible medical authority should have full-time inspection coverage of the central facility.

b. The responsible medical authority should have the authority to cause the full and immediate cessation of any production activity that could or does result in an unwholesome end item, to include denying the use of unsanitary areas, equipment, or utensils.

c. The medical authority should be responsible for the selection of samples for microbiological analysis, for making the analysis, and for interpreting the results, as well as for establishing the standards to be applied.

d. The medical authority should have access to fast and accurate laboratory support in order to ascertain the microbiological quality of each product lot prior to the release of that lot for consumption. In some geographic locations, this requirement can only be fulfilled with in-house laboratory capabilities.

e. The operator of the central preparation system should have no influence over the determination of wholesomeness but should abide by the decisions of the medical authority.

2. That esthetic and physical quality of centrally prepared foods should be the responsibility of the operator of the central facility. The operator should have qualified personnel of his staff to provide the technical expertise required to both determine the level of esthetic and physical quality of the food and to monitor production so that foods of acceptable quality will be produced. Those personnel should be organizationally separate from and on the same plane of authority under the operator as production management.

ANNEX H

FIELD FEEDING INTERFACE

DIRECTORATE OF CONCEPTS AND SYSTEMS

TSA

FIELD FEEDING EVALUATION

The Field Feeding evaluation was conducted to determine the feasibility of using Central Food Preparation Facility prepared products to support peacetime field feeding requirements. A two phased evaluation was conducted during the period 8-10 May 1978 and 25-28 September 1978 at Fort Pickett, VA. Both phases involved the participation of a TO&E company.

The first phase covering three days, although closely controlled, showed encouraging results and gave a strong indication that CFPF products could be handled and reconstituted successfully in the field with TO&E food service equipment. The detailed findings of this phase are attached at Tab A. In the second phase the evaluation parameters were "free play" rather than controlled by the evaluators. The company Food Service Sergeant developed the menu, requested and drew the desired items through normal procedures, and transported them to the field site where they were reconstituted and served to the soldier. During this four day evaluation it was demonstrated that CFPF products not only could be handled and reconstituted successfully in the field, but they increased efficiency by reducing labor requirements and improved sanitation conditions. The detailed findings/results of this phase of the evaluation are attached at Tab B.

TAB A

PHASE ONE - FIELD FEEDING EVALUATION

SECTION I

INTRODUCTION

1. PURPOSE: The Field Feeding evaluation program was conducted to determine the capabilities, potentiality and limitations of products prepared in a Central Food Preparation Facility (CFPF) to interface with peacetime field feeding requirements.
2. SCOPE: A TO&E Company, 16th Field Service Company, 240th QM Bn (Petr1 Op) with a field operating strength of approximately 150 soldiers participated in the evaluation. The evaluation was conducted at Fort Pickett, VA during the period 8-10 May 78. In addition to normal ration requirements, CFPF products were provided to the Field Service Company to supplement their menu for seven meals. The M59 Field Ranges and M2 Burner Units were used to reconstitute CFPF items.
3. BACKGROUND: The garrison/field feeding interface is an encompassing term. For example, the menu, item shelf life, storage and distribution, cooking equipment requirements, personnel staffing, to name a few, are all interacting factors of the garrison/field feeding interface. With the advent of the Central Food Preparation Facility, a new category was added to the list: Reconstitution and serving of frozen food products prepared in a central kitchen. Until this limited evaluation, the type problems or advantages associated with feeding CFPF products in the field were not actually known, although some were foreseen. This evaluation was then, in fact, conducted to determine whether CFPF products are suitable to support units training in the field.
4. OBJECTIVES: The objectives of the field feeding interface evaluation are as follows:
 - a. To determine the capabilities of TO&E field food service equipment to reconstitute centrally prepared food.
 - b. To determine the suitability of CFPF products for use in the field environment, to include packaging, handling, storage, and transportation.
 - c. To assess the advantages and disadvantages of using CFPF products to support field feeding requirements.

SECTION II

CONDUCT OF THE EVALUATION

This section summarizes the methodology used to accomplish the evaluation objectives.

1. In order to determine the field feeding capability, potentiality and limitations of Central Food Preparation Facility products, CFPF products were issued to a TO&E unit while that unit was conducting training in the field. The evaluation was closely controlled since this was the first time a unit attempted to feed large quantities of preprepared CFPF frozen products with organic food service field equipment. In addition, the decision was made to supplement the unit's normal ration requirement with CFPF products because of the unknowns associated with this concept of handling and reconstituting prepared frozen foods in the field.

2. The Commander, 240th QM Bn (Petrl Op), approved the participation of the 16th Field Service Company in the exercise after receiving a detailed briefing on the evaluation purpose and objectives. The Commander, 16th Field Service Company, and the company Food Service Sergeant were briefed to include a complete orientation on the evaluation concept of operations. A menu was developed jointly by the Food Service Sergeant and Troop Support Agency personnel. Coordination was then made with Ft Lee Directorate of Food Management and Troop Issue Subsistence Activity personnel to transfer the selected CFPF items from Ft Lee to the TISA, Ft Pickett, VA. The company was issued two additional ice chests to hold the frozen products in the field. Dry ice was also made available at the Ft Pickett TISA. Frozen CFPF items were drawn daily from the TISA in the afternoon for the evening, breakfast, and lunch meals. These products were placed in the ice chests along with chopped dry ice. The frozen products were then transported to the field site where they were prepared and served to the soldiers.

yellow cake and gingerbread were removed from the ice chest, packaging and wrapping material were removed and the products were defrosted only prior to cutting and serving.

d. The pies were removed from the ice chest, packaging material removed, and the products were thawed for three hours. The pies were then reheated using one of two methods: First, four pies were put on a sheet pan which was placed on the steel cradle in the center section of the M59 Field Range (Incl 4). Second, four pies were placed directly on top of the Field Range and were reconstituted by the heat rising through the vents. This method not only improved the field range cooking capacity but also produced an excellent product. Both methods reheated the pies to the desired internal temperature of 130°F. To insure high quality, the pies were reheated two hours prior to serving so they would have time to cool before cutting and serving.

e. The CFPF products were very acceptable to the soldiers. This was determined through informal conversations between the evaluators and soldiers. In addition, several cook personnel stated that they liked the idea of receiving prepared food in the field because of the workload reduction. In summary, this limited evaluation indicated that CFPF items can be used successfully to support field feeding requirements.

SECTION III

OBSERVATIONS AND FINDINGS

1. MENU: Prior to the field exercise, the M59 Field Range holding capacity was determined to be only four of the one-half size steam table pans or a total of 40 servings. This low capacity coupled with the fact that it would take well over an hour to reconstitute most frozen entree items dictated that an alternative method be found to increase the field range capacity. This was done. The capacity can be increased greatly if the entree items are depanned and placed in a roasting pan(s) for reconstitution. The roasting pan concept, however, produced a new constraint: entree item selection for use in the field must be the type that can be depanned and mixed while being heated. Lasagna, for example, could not be reconstituted in the field because the necessary mixing while heating in the roasting pan would severely damage the product appearance. The menu and the quantity of CFPF items selected for the evaluation are at Incl 1 and 2 respectively. The roasting pan holding capacity was validated to be eight of the one-half size steam table pans or approximately 80-90 individual servings. This number of servings is sufficient for field support when equipment issue factors for the M2 Burner Units, M59 Field Ranges and roasting pans are considered.

2. PROCEDURES AND FINDINGS:

a. The CFPF items remained frozen in the ice chests until ready for reconstitution. The holding capacity of the ice chests is as indicated at Incl 3. The meat and vegetable entrees were taken from the ice chest in a frozen state and reheated. All meat items (chili macaroni, roast beef, beef stew, pepper steak, barbecued beef (sloppy joe) and turkey scallops) were depanned and reconstituted in both the top section and center section of the M59 Field Range. These products were frequently mixed to remove hot spots from the sides and bottom of the roasting pans. Spanish onions (vegetable entree) were heated in an aluminum pot with the lid on as indicated at Incl 4.

b. The reconstitution time varied depending on the position of the roasting pan and/or the position of the M2 Burner Unit in the M59 Field Range (Incl 5). The top section was slower when compared to the middle section. When products were placed in both holding sections of the M59 Field Range at the same time and the M2 Burner placed in the bottom position (Incl 6), the heating times increased for both the top and middle sections. After reconstitution was completed, the products were placed in insulated food containers to retain temperature prior to serving (Incl 7).

c. Unlike entree items, the dessert items were removed from the ice chest, deboxed and allowed to thaw prior to reconstitution. The cinnamon rolls and yeast raised donuts, for example, were thawed for one and one-half hours. It was found that an excellent product resulted when these items were heated on top of the Field Range just long enough to remove the chill from the pan. In contrast, it was noted that these items, when heated inside of the Field Range, dried out quickly and had a tendency to stick to the bottom of the pan. The

SECTION IV

CONCLUSIONS

1. That TO&E food service equipment is adequate for reconstituting CFPF products in the field when special handling is effected.
2. That reconstitution time varies depending on the position of the roasting pan and the M2 Burner Unit in the M59 Field Range.
3. That ice chests are required to hold CFPF products in the field.
4. That the results of this evaluation indicated that CFPF products are suitable for peacetime field feeding.
5. That the evaluation was closely controlled and the findings may not be truly representative of the results/problems experienced by a unit in the field receiving full CFPF product support.

SECTION V
RECOMMENDATIONS

1. That a second evaluation be conducted of a unit using only CFPPF items with no on-site food preparation except salads and certain vegetable entrees.
2. That the evaluation include holding capability of ice chests without the use of dry ice.

MENU
FIELD FEEDING EVALUATION

<u>DATE</u>	<u>BREAKFAST</u>	<u>LUNCH</u>	<u>DINNER</u>
Mon, 8 May	- -	Meat Loaf *Chili Macaroni	Roast Turkey *Roast Beef w/Gravy *Apple Pie *Peach Pie
Tue, 9 May	Eggs to order Bacon *Cin Rolls *Yeast Raised Donuts	Fried Fish *Beef Stew *Blueberry Pie	Sl Pork *Pepper Steak *Yellow Cake w/Van Fr *Gingerbread
Wed, 10 May	Eggs to order Bacon Pan Cakes Grilled Potatoes *Cin Rolls *Yellow Cake w/Van Fr *Blueberry Pie	Breaded Veal Steaks *Spanish Onions *Barbecued Beef on Bun *Yellow Cake w/Maple Frosting	Swiss Steaks *Turkey Scallops *Blueberry Pie *Yellow Cake w/Van Fr

*CFPF Frozen Food Items

QUANTITY OF CFPF ITEMS EVALUATED

1/2 SIZE ALUMINUM STEAM TABLE PANS WITH CARDBOARD LIDS

Chili Macaroni	8 Pans	80 Servings
Roast Beef w/Gravy	8 Pans	80 Servings
Beef Stew	8 Pans	80 Servings
Pepper, Steak w/Gravy	8 Pans	80 Servings
Barbecued Beef (Sloppy Joe)	8 Pans	80 Servings
Turkey Scallops	8 Pans	80 Servings
Spanish Onions	4 Pans	72 Servings

1/2 SIZE ALUMINUM SHEET PANS

Cinnamon Rolls	8 Pans	192 Servings
Yeast Raised Donuts	3 Pans	75 Servings
Yellow Cake w/Van Fr	12 Pans	288 Servings
Yellow Cake w/Mp Fr	6 Pans	144 Servings
Gingerbread	6 Pans	144 Servings

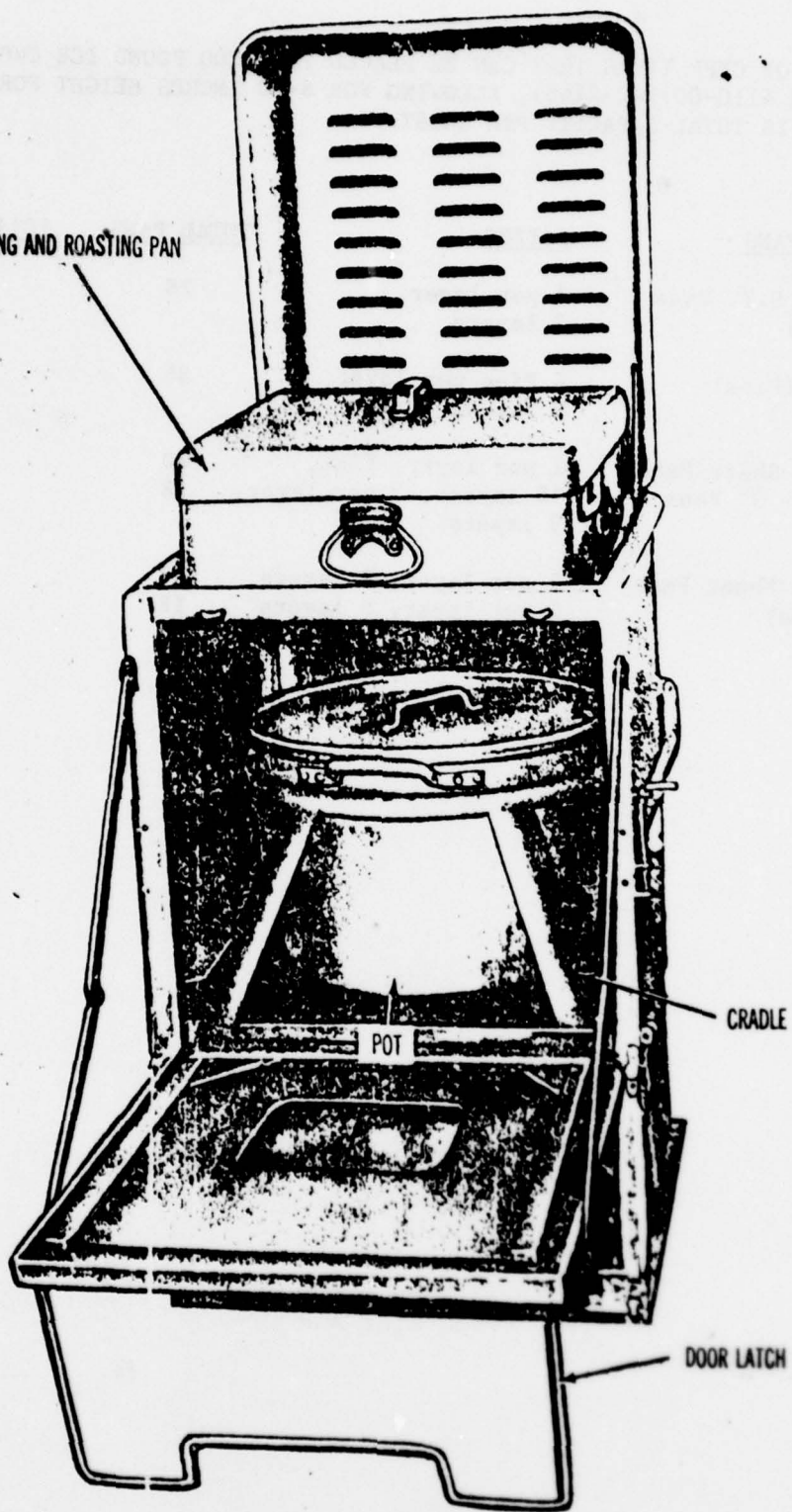
9" ALUMINUM PIE PANS

Apple Pie	12 Pans	96 Servings
Peach Pie	12 Pans	96 Servings
Blueberry Pie	24 Pans	192 Servings

QUANTITY OF CFPF ITEMS THAT CAN BE PLACED IN A 200 POUND ICE CHEST
(STOCK NUMBER 4110-00-142-2445), ALLOWING FOR 8-10 INCHES HEIGHT FOR ICE.
EACH LISTING IS TOTAL CAPACITY PER CHEST.

<u>TYPE OF PANS</u>	<u>LAYERS</u>	<u>TOTAL PANS</u>	<u>TOTAL SERVINGS</u>
1. 1/2 Size S.T. Pans (entrees)	4 per layer, 7 layers	28	280
2. 9" Pans (Pies)	4 Pies per layer 9 layers	36	288
3. 1/2 Size Sheet Pans (Cakes) - 9" Pans (Pies)	1 per layer, flat, 10 layers, 2 per layer, 9 layers	10 18	240 <u>144</u> 384
4. 1/2 Size Sheet Pans (Cin Buns)	1 per layer, 7 layers 2 per layer, 9 layers	7 18	168 <u>144</u> 312

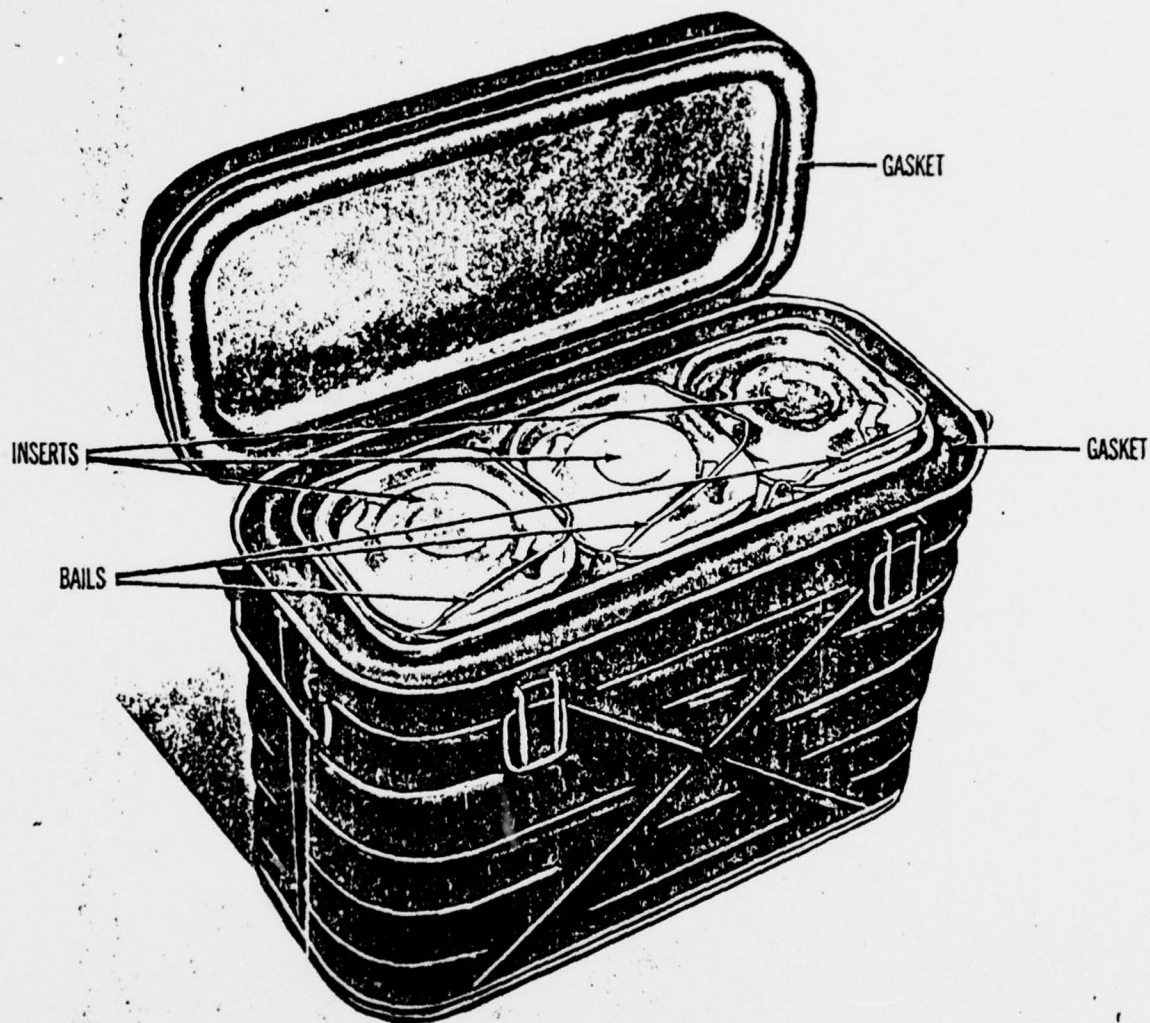
BAKING AND ROASTING PAN



RECONSTITUTION DATA

<u>PRODUCT</u>	<u>HEATING AREA</u>	<u>HEATING TIME</u>
Chili Macaroni	Top Section, M59 Field Range	130 Minutes
Roast Beef w/ Br Gravy	Center Section, M59 Field Range	56 "
Beef Stew	Top Section, M59 Field Range	90 "
Pepper Steak w/ Br Gravy	Top Section, M59 Field Range	90 "
Barbecued Beef (Sloppy Joe)	Top Section, M59 Field Range	160 "
Turkey Scallops	Center Section, M59 Field Range	120 "
Spanish Onions	Center Section, M59 Field Range	70 "
Apple Pie	Center Section, M59 Field Range	37 "
Peach Pie	Center Section, M59 Field Range	38 "
Blueberry Pie	Center Section, M59 Field Range	28 "
Blueberry Pie	Top Over Heating Vents, M59 FR	32 "
Apple Pie	Top Over Heating Vents, M59 FR	51 "
Cinnamon Rolls	Center Section, M59 Field Range	10 "
Cinnamon Rolls	Top Over Heating Vents, M59 FR	5 "
Yeast Raised Donuts	Center Section, M59 Field Range	10 "





TAB B

PHASE TWO - FIELD FEEDING EVALUATION

SECTION I

INTRODUCTION

1. PURPOSE: The Field Feeding evaluation program was conducted to determine the capabilities, potentialities, and limitations of products prepared in a Central Food Preparation Facility (CFPF) to interface with peacetime field feeding requirements.
2. SCOPE: A TO&E Company, 555th Military Police Company, 240th QM Bn (Petr OP), with a field operating strength of 125 soldiers participated in the evaluation. The evaluation was conducted at Fort Pickett, VA, during the period 25-28 September 1978. The company requested and was issued CFPF products to satisfy ration requirements. The M59 Field Ranges and M2 Burner Units were used to reconstitute CFPF items.
3. BACKGROUND: A limited field feeding evaluation was conducted during the period 8-10 May 1978. In this evaluation, CFPF products were provided to a company size unit as a supplement to the normal menu requirements in order to determine the problems associated with handling and reconstituting prepared frozen food in the field since field use of CFPF products had only been tested on a limited basis. This limited field evaluation, though closely controlled, provided encouraging results and gave a strong indication that CFPF produced items could be handled successfully in the field and reconstituted with TO&E food service equipment. As a result, a decision was made to conduct another evaluation with the second evaluation not controlled as was the first one. For the second evaluation, it was determined that the Company Food Service Sergeant would be briefed on the purpose of the exercise and lessons learned during the first evaluation. He would then select the field menu, using CFPF items whenever practical, and be responsible for requesting, transporting, and preparing these items in the field.
4. OBJECTIVES: The objectives of the field feeding interface evaluation were:
 - a. To determine the capabilities of TO&E field food service equipment to reconstitute centrally prepared food.
 - b. To determine the suitability of CFPF products in the field environment, including packaging, handling, storage, and transportation.
 - c. To assess the advantages and disadvantages of using CFPF products to support field feeding requirements.

SECTION II

CONDUCT OF THE EVALUATION

This section summarizes the methodology used to accomplish the evaluation objectives.

1. In order to determine the feasibility of using Central Food Preparation Facility (CFPF) products and accomplish the evaluation objectives, CFPF products were used by a TO&E company that was conducting training in the field. The evaluation parameters were "free play" rather than controlled by the evaluators. The unit Food Service Sergeant selected his own menu items and prepared them in the field using authorized TO&E food service equipment.
2. The Commanders, 240th QM Bn (Petrol Op), and 555th Military Police Company approved the participation of the 555th Military Police Company in the exercise after receiving a briefing on the purpose, objectives, and method of conducting the evaluation. The Company Food Service Sergeant developed the menu (See Incl 1), requested the desired items through normal procedures, and transported the items to the field site where they were prepared and served to the soldiers. In keeping with established field procedures for "A" Rations, CFPF items were drawn daily from the TISA. Two ice chests, which the company normally requires, were used to hold the frozen products and other chill items in the field. Neither dry nor wet ice was used to maintain the CFPF items in a frozen state.

SECTION III
OBSERVATION AND FINDINGS

1. MENU: The primary TO&E food service equipment used to reconstitute CFPF items in the field were the M59 Field Ranges, the M2 Burner Units, and the roasting pans. Because the M59 Field Range holding capacity is only four one-half size steam table pans or 40 servings, the contents of the one-half steam table pans were depanned directly into the roasting pan for reconstitution. As the frozen products were heated, occasional stirring and mixing was required to remove hot spots from the sides and bottom of the roasting pan. For this reason, it was determined that seven CFPF produced items were not suitable for use in the field because the mixing requirement would adversely affect the product's appearance. Items not recommended for field use are listed at Incl 2. Exclusive of these items, the Food Service Sergeant was free to select the field feeding menu of his choice. The CFPF products selected and served in the field are presented at Incl 3.

2. PROCEDURES AND FINDINGS:

a. CFPF items and other chill items were drawn daily and placed in ice chests (without ice). The items were then transported to the field site and held in the ice chests until ready for reconstitution. The items were consumed within 24 hours and no problems were experienced in retaining the products in a satisfactory frozen condition during this time. The holding capacity for each ice chest was validated at 32 one-half size steam table pans or approximately 300-320 servings.

b. Centrally prepared entree items were depanned into roasting pans for reconstitution. The holding capacity of a roasting pan was verified at 120 servings or the contents of 12 one-half size steam table pans. The contents of eight pans were initially emptied into a roasting pan. At this point the roasting pan was full; but, as the product was heated and thawed, another four pans were added. All entree items (Roast Beef, Beef Stew, Sliced Pork, Baked Beans, Swedish Meatballs, and Creamed Ground Beef) and the soups were reconstituted with the roasting pan in the position as shown at Incl 4. In addition, it was verified that the pot and cradle arrangement (Incl 4) could be used simultaneously for other products as required. However, with the M2 Burner Unit in the bottom position (Incl 5), the reconstitution time increased approximately 45 minutes compared to the time required when the Burner Unit was in the top position.

c. The donuts and cookies were left in their original fiberboard containers and were allowed to thaw prior to serving. It should be noted that these items are packaged in sealed plastic bags prior to packing in the fiberboard containers. Both items appeared fresh when served and were highly acceptable products. After removal from the ice chest, pies were

allowed to thaw for 2-1/2 hours before reheating. Four pies at a time were placed directly on top of the Field Range for approximately thirty minutes. The heat rising through the vents reheated the product to the desired internal temperature of 130°F and produced an excellent product. Best results were obtained when these items were reconstituted at least two hours prior to serving so that they had time to cool.

d. The soups were reconstituted with the field equipment in three different configurations: roasting pan on top of Field Range and M2 Burner Unit in the top position; pot and cradle in the field range and M2 Burner Unit in bottom position; and M2 Burner removed from the Field Range and placed on the ground with the pot and cradle placed on the Burner Unit. All configurations were very acceptable.

e. Garden vegetable salad was made from products (chopped lettuce, sliced carrots, diced celery, and diced sweet peppers) prepared in the Ingredient Preparation Area of the CFPF. These items were held in the ice chest until approximately 30 minutes prior to the meal period. The only work involved in preparing the garden salad was removing the ingredients from the ice chest, mixing the proper quantities together, and placing the salad in a self-service serving container. Preparation time was considerably shorter than the conventional method and sanitation standards were easily maintained.

f. Diced ham and diced cheese, also prepared and packaged in the Ingredient Preparation Area, were used to make egg omelets for breakfast. Since the ham and cheese had already been processed, the labor required to dice these products was eliminated in the field.

g. Due to continuing garrison feeding requirements, the company had only four food service personnel in the field - three cooks and the Food Service Sergeant. This reduced field staffing was adequate because the use of CFPF products eliminated a great amount of the conventional labor requirement. Cooks did not have to prepare any labor intensive items for the lunch or dinner meals. The extent of the labor reduction can be illustrated best by reviewing the labor requirements for the dinner meal on 25 October 1978.

<u>MENU</u>	<u>SOURCE</u>	<u>LABOR</u>
Roast Beef w/Gravy	CFPF	Heat and serve.
Mashed Potatoes	Can(s) (instant)	Add milk, hot water, butter, salt and pepper. Blend for about ten minutes and serve.
Lima Beans	Can(s)	Place in pot, add butter, heat, and serve.

<u>MENU</u>	<u>SOURCE</u>	<u>LABOR</u>
Minestrone Soup	CFPF	Add water, heat and serve.
Salad	Ingredient Prep Area	Mix and serve.
Chocolate Chip Cookies	CFPF	Place on serving line.
Milk	Commercial	Place on serving line.
Coffee	Can(s)	Add coffee to hot water and place on serving line.
Bread	Commercial	Place on serving line.
Salt, Pepper, Salad Dressing	Commercial (individual packets)	Place on serving line.

Under conventional food preparation methods, the roast beef, soup, and cookies require considerable labor, time and numerous ingredients for preparation. This was not the case with CFPF products. The three cooks prepared the menu items listed above and had them on the serving line in less than 1-1/2 hours. In addition to the reduced labor and faster preparation, overall sanitation was improved because the normal food losses associated with preparing meals from scratch were eliminated. Cleanup time was also shortened considerably by using the centrally prepared food products due to use of fewer cooking and serving pans and utensils.

h. Informal conversations between evaluators and soldiers revealed that the CFPF products were very acceptable. Equally important, the cooks and food service sergeant stated that they preferred CFPF items in the field because of the ease of handling and workload reduction.

i. The photographs at Incl 6 were made during the evaluation and show CFPF products during different phases of preparation in the field.

j. In summary, CFPF products can be handled safely in the field, can be reconstituted with TO&E food service equipment, simplify food preparation requirements, are well received by diners, and are suitable for supporting peacetime field feeding requirements.

k. Although not included in the field feeding evaluation, shelf stable tray packs are available commercially and appear to offer the same or more promise than CFPF products for satisfying both garrison and field feeding requirements. Since approximately 30 entree and 10 acceptable vegetable menu items are currently available, further evaluation of tray packs by the Army is suggested.

SECTION IV

CONCLUSION

1. TO&E food service equipment is adequate for reconstituting CFPF products in the field when special handling is effected.
2. Ice chests are required to hold CFPF entree products in a frozen state in the field.
3. CFPF products must be drawn daily from the issue point.
4. CFPF products are suitable for peacetime field feeding.
5. The use of CFPF products in the field reduces food service labor requirements and improves sanitation conditions.
6. The commercial tray packs appear to offer advantages in satisfying the garrison/field feeding interface and should be evaluated further.

MENU

FIELD FEEDING EVALUATION

<u>DATE</u>	<u>BREAKFAST</u>	<u>LUNCH</u>	<u>DINNER</u>
Mon, 25 Sep	-	"C" Rations Beverages	*Roast Beef w/Gravy Mashed Potatoes Lima Beans *Minestrone Soup *Salad *Chocolate Chip Cookies Beverages
Tue, 26 Sep	Eggs to order Bacon *(Diced Ham & Cheese used in Omelets) *Creamed Ground Beef *Yeast Raised Dough- nuts Beverages	"C" Rations *Knickerbocker Soup Beverages	*Beef Stew Rice Peas *Cole Slaw *Bean Soup *Sugar Cookies *Yellow Cake w/Choco- late Icing
Wed, 27 Sep	Eggs to order Bacon *(Diced Ham & Cheese used in Omelets) *Creamed Ground Beef *Yeast Raised Dough- nuts Pancakes Beverages	*Sliced Pork w/Gvy *Swedish Meat Balls *Baked Beans *Spanish Onions *Knickerbocker Soup *Salad *Spice Cake *Peanut Butter Cookies Beverages	Grill Steaks Mashed Potatoes Peas *Salad *Short Bread Cookies *Blueberry Pie Beverages
Thu, 28 Sep	Eggs to order Bacon *(Diced Ham & Cheese used in Omelets) *Creamed Ground Beef *Yeast Raised Dough- nuts Beverages		

*CFPF Items

Incl 1

H-21

ITEMS NOT RECOMMENDED FOR USE IN THE FIELD

Baked Lasagna

Chicken Fried Beef Patties

Meat Loaf w/Brown Gravy

Oven Fried Chicken

Savory Baked Chicken

Southern Fried Chicken

Baked Tuna and Noodles

CFPF ITEMS USED IN THE FIELD

Roast Beef with Brown Gravy

Beef Stew

Sliced Pork with Brown Gravy

Baked Beans

Swedish Meatballs

Spanish Onions

Creamed Ground Beef

Diced Ham

Diced Cheese

Knickerbocker Soup

Minestrone Soup

Old Fashioned Bean Soup

Yeast Raised Doughnuts

Chocolate Chip Cookies

Shortbread Cookies

Peanut Butter Cookies

Sugar Cookies

Blueberry Pie

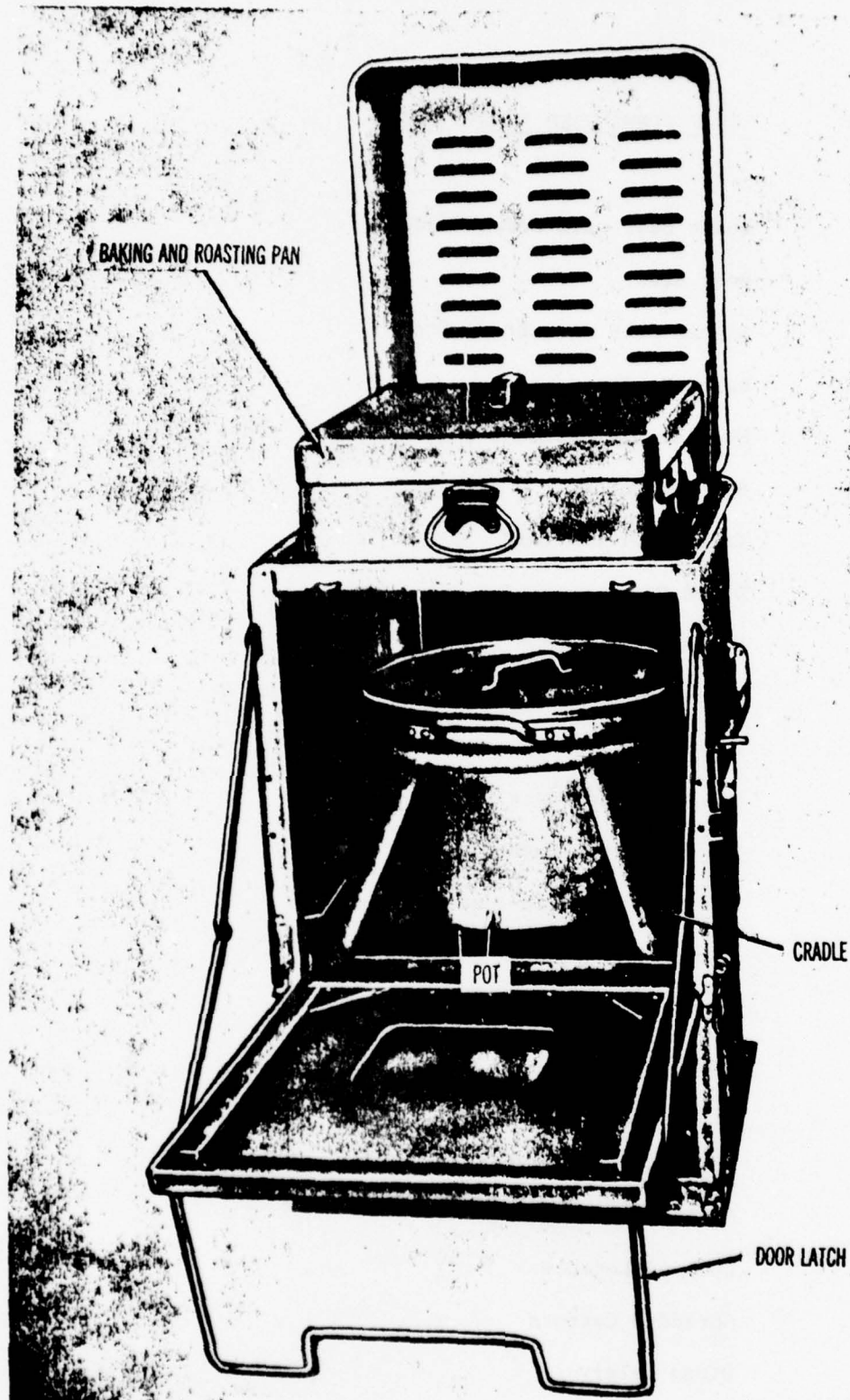
Spice Cake with Vanilla Icing

Shredded Cabbage

Chopped Lettuce

Shredded Carrots

Diced Celery





H-25

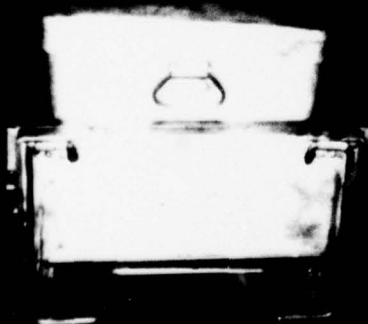
Incl 5



Beef Stew in 1/2 Steam Pan



Emptying Contents into Roasting Pan for Reconstituting.



Reconstituting Product by Using a Roasting Pan, M59 Field Range and M2 Burner Unit.



Mixing of Product to Remove Hot Spots



Filling Insulated Food Container
with CFPF Products.



Serving Line

CFPF Items - Sliced Pork, Baked
Beans, Spanish Onions, Salad,
and Cookies.

ANNEX I

MOBILIZATION IMPACT

DIRECTORATE OF CONCEPTS AND SYSTEMS

TSA

MOBILIZATION IMPACT

1. PURPOSE: To assess the capabilities of a Central Food Preparation Facility (CFPF) to expand its food preparation support during mobilization of forces.

2. SCOPE: The current mobilization troop stationing plan designates Reserve Component (RC) units to utilize a specific post, camp, or station as their mobilization station. The expansion of post, camp, or station activities and functions to support mobilization/deployment schedules will require a corresponding increase in food service requirements. This study was conducted to determine whether an existing CFPF could be expanded on an emergency basis to provide subsistence support to an expanded force structure.

3. BACKGROUND:

a. Any situation requiring mobilization, other than selective mobilization, will be of sufficient gravity as to require emergency expansion of the peacetime support base. Expanded subsistence support must be provided to Active Component, mobilized RC units, and activated AUS units within hours/days of the mobilization alert order.

b. Provisioning of subsistence support will be characterized by detailed, centralized planning and decentralized execution. Mobilized forces must be supported with adequate resources - funds, facilities, supplies, and equipment. Centralized subsistence planning will project and acquire required Class I support, while decentralized execution of food preparation will ensure the serving of wholesome, nutritious food.

c. Each mobilization station has prepared guidelines, concepts, and procedures in the logistic food service/subsistence supply activities to ensure the attainment of required readiness posture of ARNG and USAR mobilized units.

4. ASSUMPTIONS:

a. Cadre personnel and installation equipment at the mobilization station will be retained, and additional civilian/military personnel, equipment, and supplies required to support the military expansion will be provided on a timely basis.

b. The Mobilization Station will receive, house, train, equip, and support active components, mobilized RC units, and activated AUS units with the same level and quality of food service support. Recognition is made of the fact that various billeting arrangements will be provided and, although utilization of fixed facilities will be maximized, a requirement to establish field sites will most likely exist.

c. Production capabilities of the existing CFPF can be expanded either by adjusting/modifying the master menu, increasing the labor force, and/or extending the daily hours of operation. (Mobilization Station commander will have the authority to modify the current monthly master menu to minimize food service problems during mobilization.)

d. Ration procedures established in AR 30-1 will be utilized to support all Forces. Fiscal management tolerances and BDFA restrictions will remain in effect under mobilization.

5. DISCUSSION:

a. Mobilization order will be issued by proper authority. Upon receipt of this order, mobilization stations will initiate their plan for logistics support to the arriving units. Mobilized units/individuals will be assigned to both permanent and temporary billeting facilities and will subsist in assigned dining facilities. Extended feeding periods will be instituted as required. Field sites will be established when permanent and temporary facilities are fully occupied.

b. Conclusions derived from the field feeding evaluation indicate that CFPF products are suitable for peacetime field feeding. Food service equipment authorized by the unit's TO&E is adequate for reconstituting CFPF products. Ice chests are necessary for maintaining CFPF products in a frozen state for up to 24 hours and must be made available to units supported by the CFPF.

c. The production capacity of an existing CFPF at the mobilization station could be substantially expanded by increasing the labor force, extending the work week to two 10-hour shifts, and/or simplifying the menu to emphasize basic menu items which readily lend themselves to high volume central production. The existing CFPF work force could be distributed evenly to form a nucleus of trained personnel for each work shift. The reassignment of dining facility cooks who have been trained previously in CFPF production techniques can be used to fulfill the cook requirement in the CFPF. Other personnel, such as food service workers, janitors, and warehousemen possessing required skill levels should be readily available from the local civilian population. The establishment of two ten-hour work shifts is expected to maximize production capacity and concurrently provide adequate time for equipment maintenance. Some problems can be expected, however, in obtaining additional supervisors who have been trained in central food production. Menu adjustments will enable the CFPF to operate in a semi-continuous, large-lot production mode. This will greatly increase proficiency by eliminating the requirement to produce a multiplicity of items in small lot sizes to satisfy the expansive 42-day master menu. It is estimated, based upon the foregoing conditions, that CFPF production capacity could be expanded, in a limited time frame, from three to four times the previous capacity. Such expansion would greatly enhance the responsiveness and posture of the food serving program at a CFPF supported base during mobilization.

d. The Fort Lee CFPF evaluation indicates that CFPF support substantially reduces the food preparation effort required at the dining facility level and enables cook personnel to prepare and serve acceptable meals with minimal cooking proficiency. Concurrently, it was demonstrated that conventional staffing levels could also be reduced, both in garrison and field feeding when supported with CFPF products. Only limited training and orientation of mobilized unit food service personnel would be necessary for the proper reconstitution and serving of CFPF products in garrison or in the field. Reconstitution guides, which contain the detail procedures for reheating CFPF products, would be distributed to incoming units and would provide a ready reference for proper preparation techniques. Reduced cook/skill requirements would allow for a maximum effort by available trained cooks to provide timely on the job training of mobilized cook personnel. The installation/unit's capability to accomplish their feeding mission would also be increased, especially should a shortage of cook personnel exist at the time of mobilization.

6. ADVANTAGES OF CFPF DURING MOBILIZATION:

- a. Improves the installation's capability to feed expanded forces at the mobilization station.
- b. Reduces the number of dining facility cook personnel required to support expanded troop strength.
- c. Enables the installation/unit to maintain a uniform and quality meal service even though cook personnel may lack the experience, training, and skill levels normally evidenced under conventional systems.

7. CONCLUSION:

- a. That a CFPF capability can be expanded with minimum resources to effectively support increased mobilization troop strengths.
- b. That a CFPF would reduce the total number of food service personnel required at the mobilization station, and would help compensate for any lack of experienced/trained cooks at the time of mobilization.
- c. That a CFPF would not solve all the food preparation problems during mobilization, but would provide a viable and responsive capability for rapid transitional food service support expansion.

ANNEX J

ORGANIZATION/MANAGEMENT STRUCTURE

DIRECTORATE OF CONCEPTS & SYSTEMS

TSA

ORGANIZATION/MANAGEMENT STRUCTURE STUDY

I. INTRODUCTION:

A study was conducted to determine the management structure required to operate and manage an installation Central Food Preparation System (CFPS). A CFPS is composed of the following activities: Central Food Preparation Facility (CFPF) with a Quality Control Laboratory; Troop Issue Subsistence Activity (TISA); and dining facilities receiving centrally prepared foods, the integral part being the CFPF. It was assumed that the CFPS would be proliferated to installations where economies of operations would be achieved.

In accordance with AR 10-10, the Directorate of Industrial Operations (DIO) directs and coordinates those activities involved in installation support, to include the installation food service program. The Services Division of the DIO is responsible for supervising and coordinating those logistics services, such as the installation food service program, troop issue subsistence and laundry and dry cleaning. This division, in order to supervise and coordinate logistics services, is usually composed of the following branches: Food Service; Troop Issue Subsistence; and Laundry and Dry Cleaning. The Troop Issue Subsistence Branch is responsible for managing and coordinating those actions necessary to insure an uninterrupted supply of subsistence to dining facilities. The Food Service Branch coordinates, assists, and advises on all phases of food service, but does not have operational control of dining facilities and Food Service personnel.

As an approved DA exception to AR 10-10 until 30 Sep 80, the Fort Lee CFPS is controlled and operated by the Directorate of Food Management (established in 1972). The authority of the Fort Lee DFM embodies all garrison troop food service activities, except the hospital. The Director is on the same staff level as other installation directors. The DFM operates the Troop Issue Subsistence Activity (TISA), Central Food Preparation Facility (CFPF), Technical Support Office, and TDA and TOE dining facilities. Also, the Director of Food Management exercises operational control (instead of providing advisory assistance) over both TDA and TO&E dining facilities. This includes TDA and TO&E Food Service personnel, as well as the logistical and training requirements necessary to support the installation food program.

II. CONDUCT OF THE EVALUATION:

The evaluation was conducted by personnel from the Systems Development Division, Directorate of Concepts and Systems, Troop Support Agency. The purpose of the evaluation was to determine the type management structure and level of control required to operate a CFPS on an installation. The operating elements of the Fort Lee Central Food Preparation System were

observed during the formal evaluation period in 1978. Other installations were also visited to observe the operation of the food program and to evaluate whether the conventional food service management structure could be used to manage a CFPS. The conduct of the evaluation was subjective and the results are qualitative.

III. OBSERVATIONS AND FINDINGS:

A. General: The proper management influence and coordination or operational control of the various elements of the CFPS is critical to the effective operation of the system. As such, the complexity and management requirements of the CFPS dictate that it be controlled and directed at installation level. This is necessary to achieve the following: maximum utilization of high volume production; the timely utilization of centrally prepared products; interface of the TISA and dining facilities with the CFPP; and the flexible and responsive direction required for a CFPS. Therefore, the alternatives to manage and operate a CFPS are limited. The two most viable options for controlling a CFPS are:

1. Establish a Directorate of Food Management (DFM) similar to that operating at Fort Lee, VA.
2. Establish a Central Food Preparation Branch in the Services Division of the Directorate of Industrial Operations (DIO).

B. Directorate of Food Management:

1. At Fort Lee, the CFPS is controlled by the Directorate of Food Management (DFM). The Director is on the same staff level as other installation directors. The DFM at Fort Lee is established in accordance with the organizational schematic at Tab A. In order to establish a DFM, the food related functions of the Services Division, DIO, were transferred to this Directorate and the Services Division was abolished. In addition, a deviation from AR 10-10 was obtained from Department of the Army until 1980.
2. The authority of the DFM encompasses all garrison troop food service operations, except the hospital dining facility. The DFM is composed of a Dining Facility Operations Division, a Support Division, a Technical Support Office, and a Central Food Preparation Division. The Dining Facility Operations Division is responsible for the operation, management and control of all installation dining facilities and TDA and TOE food service personnel except hospital. The Support Division provides management of support functions to include training, plans, Troop Issue Subsistence Activity functions, property book, self-service supply center support, and maintenance support functions. The Technical Support Office is responsible for the quality control/assurance of centrally produced food items. Central preparation of menu components (ambient, refrigerated, and frozen) is controlled and managed by the Central Food Preparation Division.

3. This management structure provides a means to be responsive and flexible to the requirements of a CFPS. It provides central direction, control, and interface of the TISA and dining facilities with the CFPF which provides an environment to efficiently and effectively operate the system. This was partly assisted by total control over the operating dining facilities. The operational experience gained at Fort Lee strongly indicates that a CFPF must be managed and controlled at installation level for an effective operation. In addition, it is essential that the TISA operations totally intermesh with those of the CFPF as related to forecasting, requisitioning, inventory control and issuing of food items. To accomplish this, the TISA and CFPF must be centrally managed by the same individual. In order to further insure this interface, the TISA and CFPF operations could be integrated into a Central Issue and Preparation Division under the DFM concept.

c. Services Division of DIO: Another feasible means of controlling and managing a CFPS is to establish a Central Food Preparation Branch in the Services Division of the DIO. This alternative will provide the necessary centralized direction, control, interface, and management for a CFPS except for actually operating dining facilities. The dining facility interface could be provided in the Services Division through the conventional installation food advisor function. The Chief of Services Division would be responsible for all food related functions, including operating the TISA and CFPF and providing centralized advice and assistance to TDA and TOE dining facilities. Since most Army installations, where a CFPF would be proliferated, have a Services Division, the disruption normally associated with organizational changes would be minimal for this alternative, as compared to establishing new Directorate level management.

The Services Division of the DIO would provide centralized direction, control, and interface of all the installation food service functions, i.e., the Troop Issue Subsistence and the Food Service branches of the Services Division. It should be established in accordance with the organizational schematic at Tab B. This organizational structure places all food service related functions under the direction of one individual, the Chief, Services Division. As such, this individual, without being elevated to directorate level, can effectively and efficiently coordinate the operations of a CFPF as to its interface with Troop Issue Subsistence Activity (TISA), and provide the responsive and flexible guidance required to manage and control a CFPS. As indicated, the interface with dining facilities under this management structure will be through advice and assistance rather than the actual operation and control of all dining facilities, less hospital food service, as provided by the Directorate level organization established at Fort Lee, VA. However, this should not adversely impact on dining facilities interfacing with the installation CFPS. Since the Chief, Services Division, has operational control of the TISA and can exert significant influence over the installation menu board, the impact of not having operational control of the dining facilities should be minimal. In addition, the Chief, Services Division, can provide centralized direction to the dining facilities through the Food Service Branch.

The Services Division would be responsible for coordinating, assisting, and advising on all phases of the installation food service program. To accomplish this, there would be Food Service, Troop Issue Subsistence, and Central Food Preparation Branches. The Food Service Branch coordinates, assists, and advises on all phases of food service, to include providing budget estimates for equipment procurement, menu board meetings, participating in development of KP and cook requirements used in contract negotiations, test, surveys, centralized direction in the use and ordering of centrally prepared products, coordinate assignment of installation food service personnel and advisory visits. The Troop Issue Subsistence Branch is a major contributor to the Central Food Preparation System. This branch is responsible for managing and coordinating those actions necessary to insure an uninterrupted supply of subsistence to the CFPF and dining facilities. The day-to-day operations of this branch must be interwoven with those of the Central Food Preparation Branch. Also, the functions of Troop Issue Subsistence, such as forecasting, requisitioning, inventory control and issuing of food items are interrelated with those of the Central Food Preparation Branch; therefore, central control is essential to intermesh the resources and objectives of the TISA and CFPF. This centralized direction and interface of functions may be further realized by integrating the TISA and CFPF into a single branch. The Central Food Preparation Branch will be responsible for the central preparation of meal components (ambient, refrigerated, and frozen). The Technical Support Section of the Services Division will be responsible for insuring quality control in the CFPF, and the installation MEDDAC will be responsible for quality assurance. The Services Division Chief would still remain responsible for the Laundry and Dry Cleaning Branch and mortuary functions. This organization and management structure provides essentially the same advantages as directorate-level management, including a means to control a CFPF at installation level. This management scheme for a CFPS is within the guidelines of AR 10-10.

IV. SUMMARY:

The operational experience gained at Fort Lee strongly indicates that a CFPF must be managed and controlled at installation level for effective operation. It is essential that a CFPF have centralized management and control to achieve the economies of operation and insure proper utilization and control of products produced in the CFPF. The dining facilities, Troop Issue Subsistence Activity, and CFPF operations are such that a large degree of compatibility or interface must exist. The Fort Lee DFM organization has provided this interface capability as well as the direction and control of the entire food service program at Fort Lee with a CFPF. However, it is not necessary to establish a directorate-level organization to control a CFPS on an installation. The same advantages to be acquired by directorate-level management are available with an alternative management organization; the expansion of the Services Division of the DIO to include the Central Food Preparation Facility. The CFPS is still controlled at installation level which is essential for a system of this complexity. The organization and management structure of the Services Division will provide the necessary

centralized direction, control, and interface to efficiently and effectively manage and operate a CFPS on an installation, without establishing separate Directorate level management. Also, the organizational change and disruption would be minimized.

V. CONCLUSIONS:

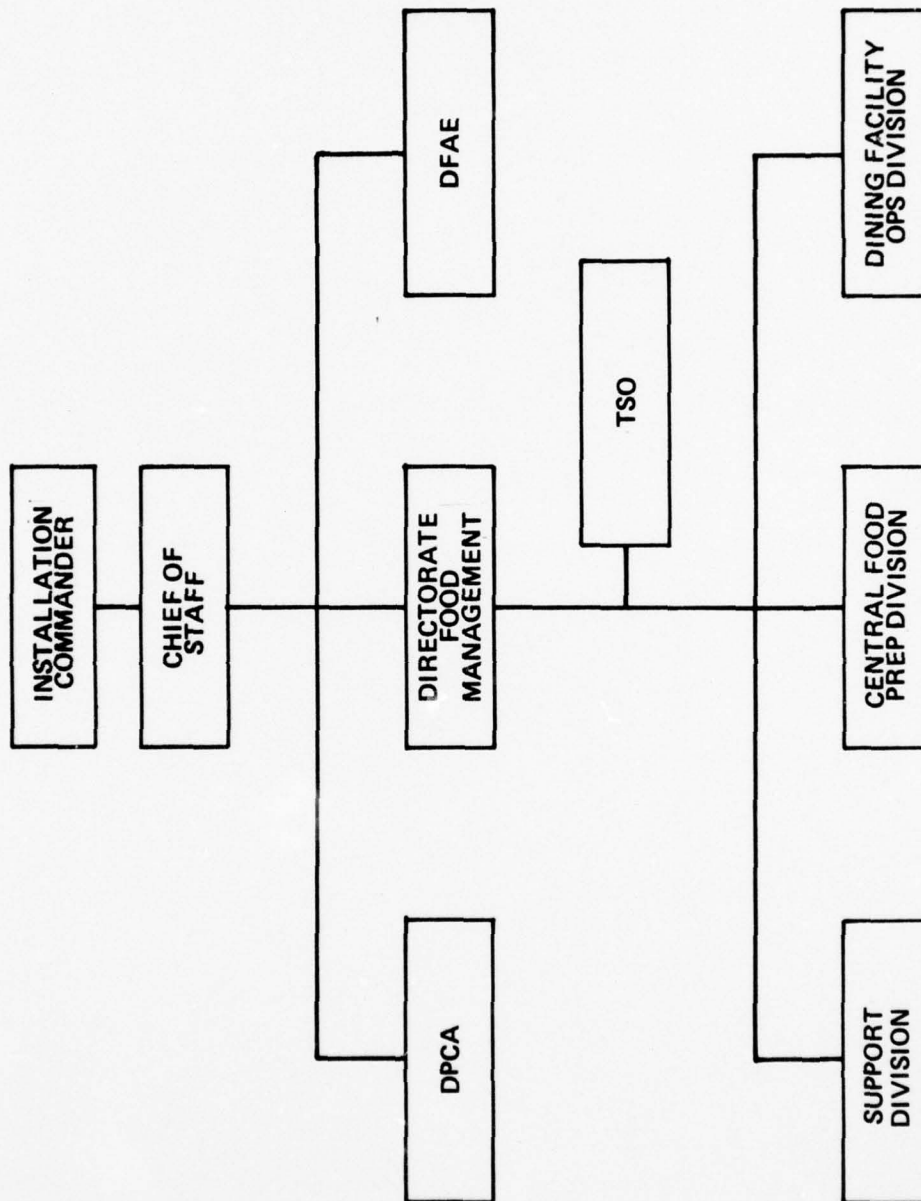
A. It is not necessary to have a Directorate of Food Management to control and manage a CFPS; however, installation level control of a CFPS is required in order to provide the centralized direction, control, and interface to efficiently and effectively manage and operate a CFPS on an installation.

B. This management and control of a CFPS at installation level can be accomplished by establishing a Central Food Preparation Branch in the Services Division of the DIO.

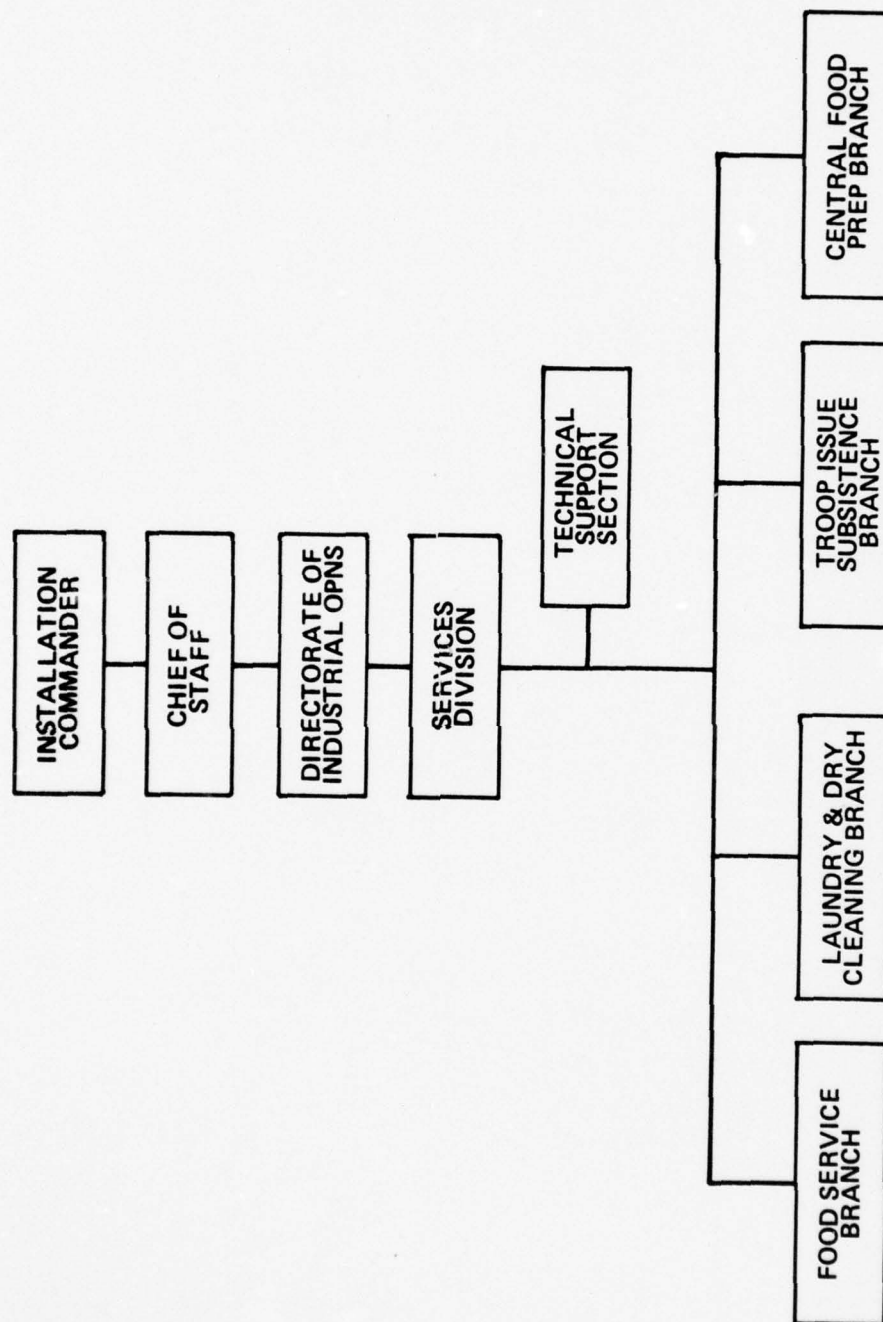
VI. RECOMMENDATIONS:

A. That, if the CFPS concept is proliferated to other installations, it be controlled at installation level by establishing a Central Food Preparation Branch in the Services Division of the DIO.

B. That the Services Division be organized in accordance with the organizational schematic at Tab B.



ORGANIZATION SCHEMATIC FOR THE FORT LEE DIRECTORATE OF FOOD MANAGEMENT



ORGANIZATION SCHEMATIC FOR CONTROLLING A CFPS ON AN INSTALLATION